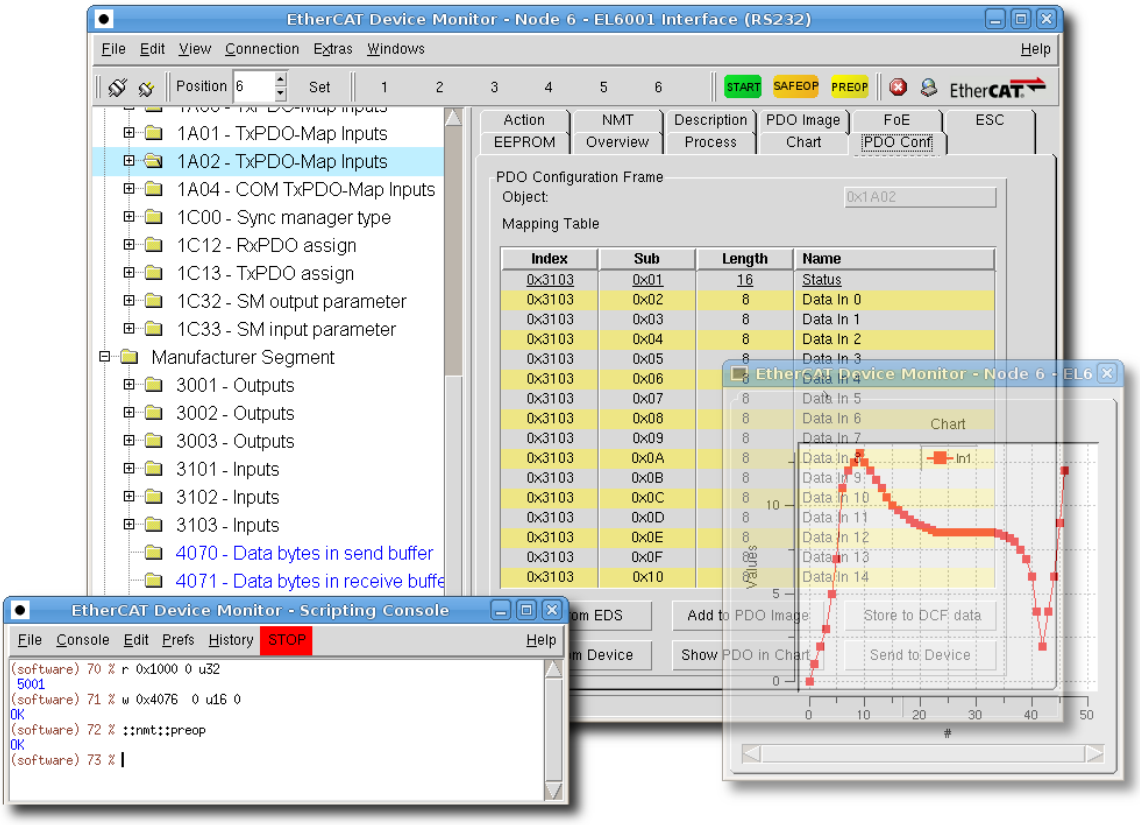
EtherCAT® Device Monitor
User Manual


EtherCAT Device Monitor - Node 6 - EL6001 Interface (RS232)
File Edit View Connection Extras Windows Help
Position 6 Set 1 2 3 4 5 6
START SAFEOP PREOP
EtherCAT
1A01 - TxPDO-Map Inputs
1A02 - TxPDO-Map Inputs
1A04 - COM TxPDO-Map Inputs
1C00 - Sync manager type
1C12 - RxPDO assign
1C13 - TxPDO assign
1C32 - SM output parameter
1C33 - SM input parameter
Manufacturer Segment
3001 - Outputs
3002 - Outputs
3003 - Outputs
3101 - Inputs
3102 - Inputs
3103 - Inputs
4070 - Data bytes in send buffer
4071 - Data bytes in receive buffe
Action NMT Description PDO Image FoE ESC
EEPROM Overview Process Chart PDO Conf
PDO Configuration Frame
Object: 0x1A02
Mapping Table
Index Sub Length Name
0x3103 0x01 16 Status
0x3103 0x02 8 Data In 0
0x3103 0x03 8 Data In 1
0x3103 0x04 8 Data In 2
0x3103 0x05 8 Data In 3
0x3103 0x06 8 Data In 4
0x3103 0x07 8 Data In 5
0x3103 0x08 8 Data In 6
0x3103 0x09 8 Data In 7
0x3103 0x0A 8 Data In 8
0x3103 0x0B 8 Data In 9
0x3103 0x0C 8 Data In 10
0x3103 0x0D 8 Data In 11
0x3103 0x0E 8 Data In 12
0x3103 0x0F 8 Data In 13
0x3103 0x10 8 Data In 14
Add to PDO Image
Store to DCF data
Show PDO in Chart
Send to Device
EtherCAT Device Monitor - Node 6 - EL6
Chart
In1
Values
#
EtherCAT Device Monitor - Scripting Console
File Console Edit Prefs History STOP Help
(software) 70 % r 0x1000 0 u32
5001
(software) 71 % w 0x4076 0 u16 0
OK
(software) 72 % ::nmt::preop
OK
(software) 73 %

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© 0 *port* GmbH
Regensburger Straße 7
D-06132 Halle
Tel. +49 345 - 777 55 0
Fax. +49 345 - 777 55 20
E-Mail service@port.de
Internet http://www.port.de

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1.

1.1.

The EtherCAT® Device Monitor (EDM) communicates with EtherCAT® devices in EtherCAT® networks by using of various EtherCAT® services. Therewith the Device Monitor supports:

- development,
- diagnostic,
- implementation and configuration

of EtherCAT® devices.

The EtherCAT® Device Monitor uses an EtherCAT® server to communicate with the EtherCAT® devices. The communication between the graphical user interface and the server is done by the TCP/IP protocol.

The EtherCAT server is as an EtherCAT Master and it can run on the local PC as the EtherCAT® Device Monitor or on a separate device.

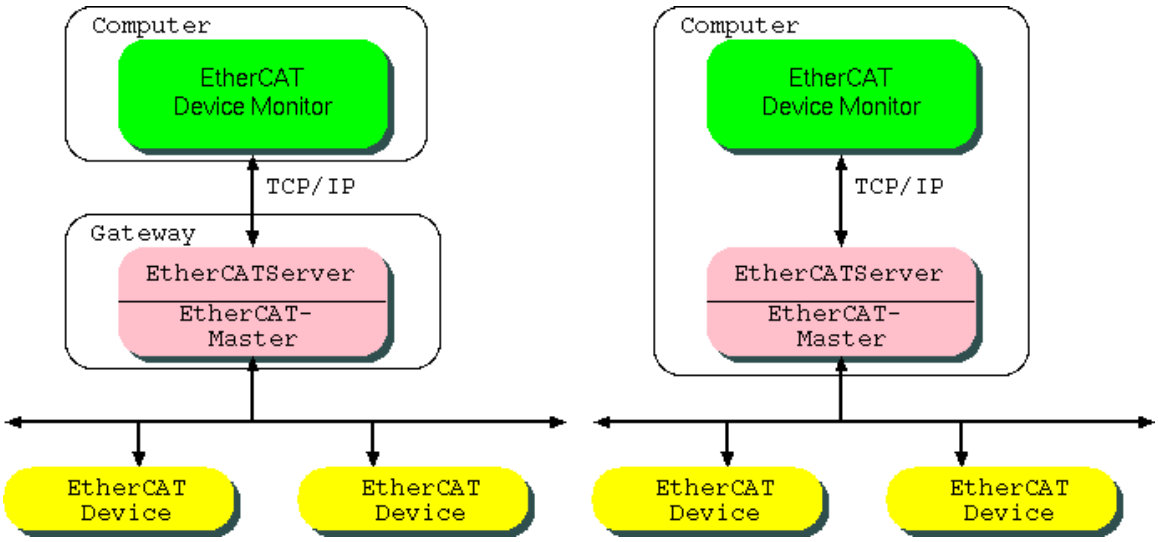


Figure 1: Structure of the EtherCAT® Device Monitor

The EtherCAT® Device Monitor is available in two variations:

- full edition and
- Starter Kit edition.

The StarterKit edition has the following limitations:

- no console for work with scripts,
- no device configuration by DCF file,
- support of only some fixed node IDs

- no support for FoE and EEPROM access
- run-time limited to 30 minutes

The EtherCAT® Device Monitor has the capability to execute scripts in full edition. A script can contain variables and control structures just like in every modern structured language. Complete master applications can be developed using the language Tcl/Tk ⟨`http://www.tcl.tk`⟩.

The Device Monitor has the following requirements to the system it is running on:

Operating System:	Windows™, Vista™ UNIX (LINUX)
RAM:	512 MByte
Hard Disk:	25 MByte

1.2.

This manual uses the following conventions:

OPERATIONAL	Communication states are written in capital letters.
`tcl_command`	Tcl commands appear in Courier (constant width font). Exceeds the length of a Tcl command line the paper width, this line is finished with a \ (backslash) and continued in the following line.
`example`	Fragments of code and examples appear in Courier (constant width font).
0x<value>	Hexadecimal values are designated by the prefix '0x'.
<key>	Keys are designated by < >-braces.
<set_value>	Replace set_value by the desired value if this term is a part of a functional description.
[option]	Replace option by an option of the function.
"directory"	Directories are signified with quotation marks.
Console → Save.. → All	the users way through menus

1.3.

port supports the user by telephone hot-line and by seminars. Additionally *port* offers consultations in the whole field of EtherCAT® e.g. network planning, network configuration, selection of devices and EtherCAT® and CANopen Profile implementations.

2.

2.1.

The most common use case of the EtherCAT® Device Monitor is the is that the EtherCATServer is used locally on the same PC as the EtherCAT® Device Monitor. Prior to the first usage of the tool the must be configured to start the EtherCATServer automatically. To do so, open the interface configuration dialog at Connection -> EtherCAT®-Interface . Specify "Local EtherCATserver" in the field "EtherCAT-Interface and below the path to the file `ecatserver.exe` has to be entered. Finally, the physical Ethernet interface device has to be specified, which shall be used by the EtherCAT® Device Monitor to access the EtherCAT network.

For the second possible use case, using an EtherCATserver whichs runs on a remote PC or embedded device, "TCP" has to be selected as EtherCAT interface and its IP address or host name must be specified at the input field named "host"

For both use cases, ensure that the EtherCATserver is connected with the EtherCAT network with a cable connection and that the right ethernet interface is specified, if the PC or embedded device supports more than one interface.

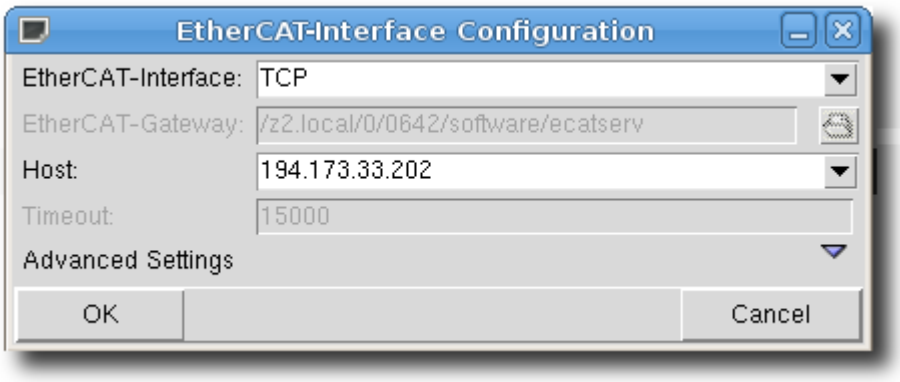


Figure 7, EtherCAT® Interface Configuration

After the configuration the connection can be established. Click on the first symbol in the toolbar to connect to the device.

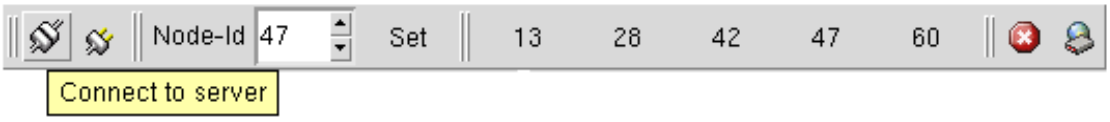


Figure 8, Connect button in tool bar

! After the connection is established, the EtherCAT® gateway validates the license on the gateway. If the license is not valid, the EtherCAT® Device Monitor can only communicate with a few nodes (demo functionality).

The EtherCAT® Device Monitor connects to the EtherCAT® server now and at success the online status is displayed in the status bar and the background of the entry field turns pink.

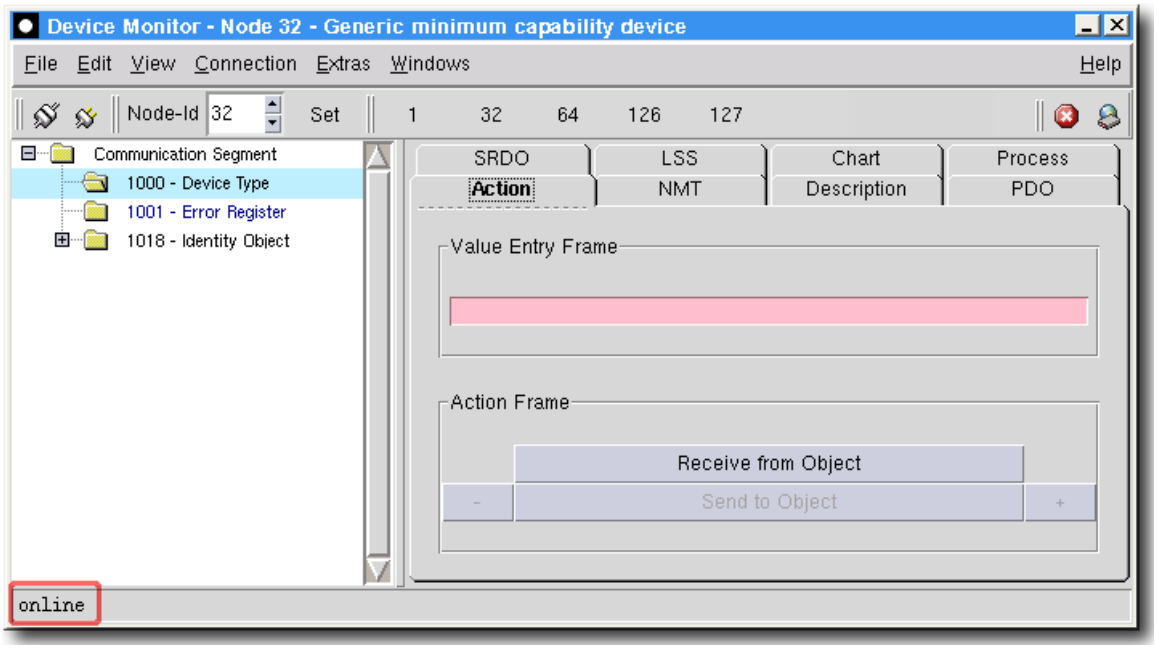

Device Monitor - Node 32 - Generic minimum capability device
File Edit View Connection Extras Windows Help
Node-Id 32 Set 1 32 64 126 127
Communication Segment
1000 - Device Type
1001 - Error Register
1018 - Identity Object
SRDO LSS Chart Process
Action NMT Description PDO
Value Entry Frame
Action Frame
Receive from Object
Send to Object
online

Figure 3: EtherCAT® Device Monitor

! A valid configuration of the hardware interface is saved by the EtherCAT® Device Monitor and can be reused at the next start of the program. Additionally it is possible to activate Extras → Options → Auto-Connect so that the EtherCAT® Device Monitor connects automatically at every start of the program.

2.2.

Adjust the node ID of the EtherCAT® device in the tool bar first. Please take into account that the choice must be confirmed with "Set".

Figure 4: Toolbar

As a second step the EDS file of the device can be loaded via File →Load EDS. Alternatively the mandatory objects can be accessed by the default EDS.

After the selection of an object in the EDS tree you can access it for reading and writing on the "action tab" depending on the access type. When pressing "Send to object" only the expression after the last blank is transmitted. It is possible to write mathematical expressions into the entry field as well. The EtherCAT® Device Monitor calculates them

and transmits the result to the device. However, the expression may not contain any blanks.

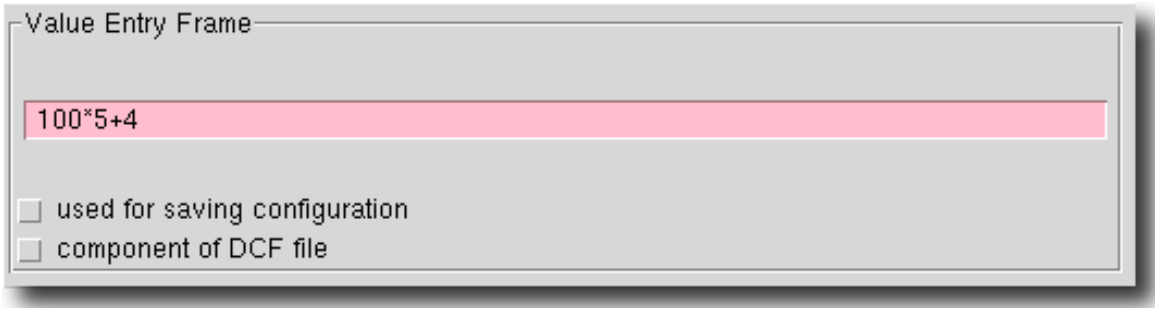


Figure 5: Formulas in the entry

The "NMT tab" serves for sending NMT commands. This tab can be torn off like every tab from the anchorage in the EtherCAT® Device Monitor out into a separate window. To tear it off, click on the dashed line above the tab.

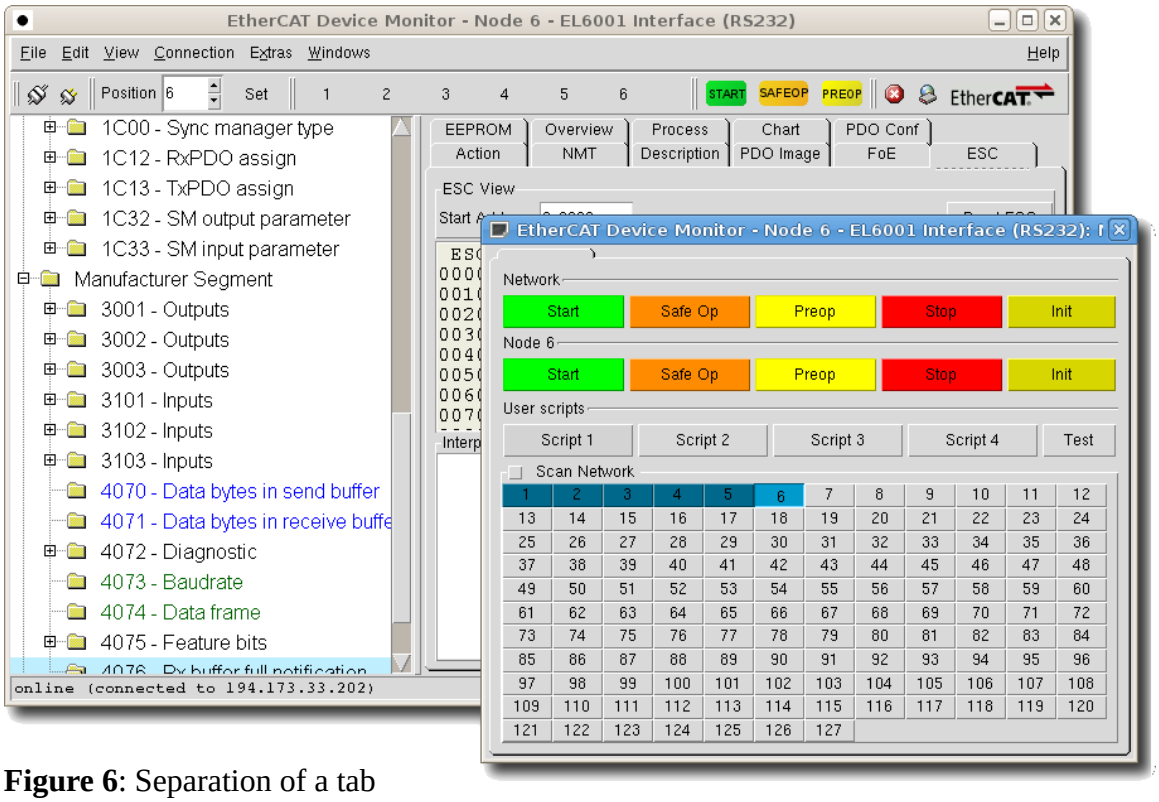

EtherCAT Device Monitor - Node 6 - EL6001 Interface (RS232)
File Edit View Connection Extras Windows Help
Position 6 Set 1 2 3 4 5 6
START SAFEOP PREOP
EtherCAT
1C00 - Sync manager type
1C12 - RxPDO assign
1C13 - TxPDO assign
1C32 - SM output parameter
1C33 - SM input parameter
Manufacturer Segment
3001 - Outputs
3002 - Outputs
3003 - Outputs
3101 - Inputs
3102 - Inputs
3103 - Inputs
4070 - Data bytes in send buffer
4071 - Data bytes in receive buffe
4072 - Diagnostic
4073 - Baudrate
4074 - Data frame
4075 - Feature bits
online (connected to 194.173.33.202)
EEPROM Overview Process Chart PDO Conf
Action NMT Description PDO Image FoE ESC
ESC View
EtherCAT Device Monitor - Node 6 - EL6001 Interface (RS232):
Network
Start Safe Op Preop Stop Init
Node 6
Start Safe Op Preop Stop Init
User scripts
Script 1 Script 2 Script 3 Script 4 Test
Scan Network

Figure 6: Separation of a tab

The upper command bar serves for sending the NMT commands to the whole network and with the lower one the current node is addressed. The current node can be changed quickly by the node buttons in the lower part of the NMT tab.

3.

The object dictionary is the data interface between the EtherCAT® Device Monitor and the EtherCAT® device. The EtherCAT® Device Monitor can access every object in the object dictionary for reading or writing by index/subindex.

The EtherCAT® Device Monitor shows the object dictionary loaded from the Electronic Data Sheet (ESI file) of the device in a tree-structure.

An ESI can be loaded for each device in the network. After the selection of a device its object dictionary is displayed and communcation with the device is possible.

Using the tab Action objects can be accessed by SDO transfers.

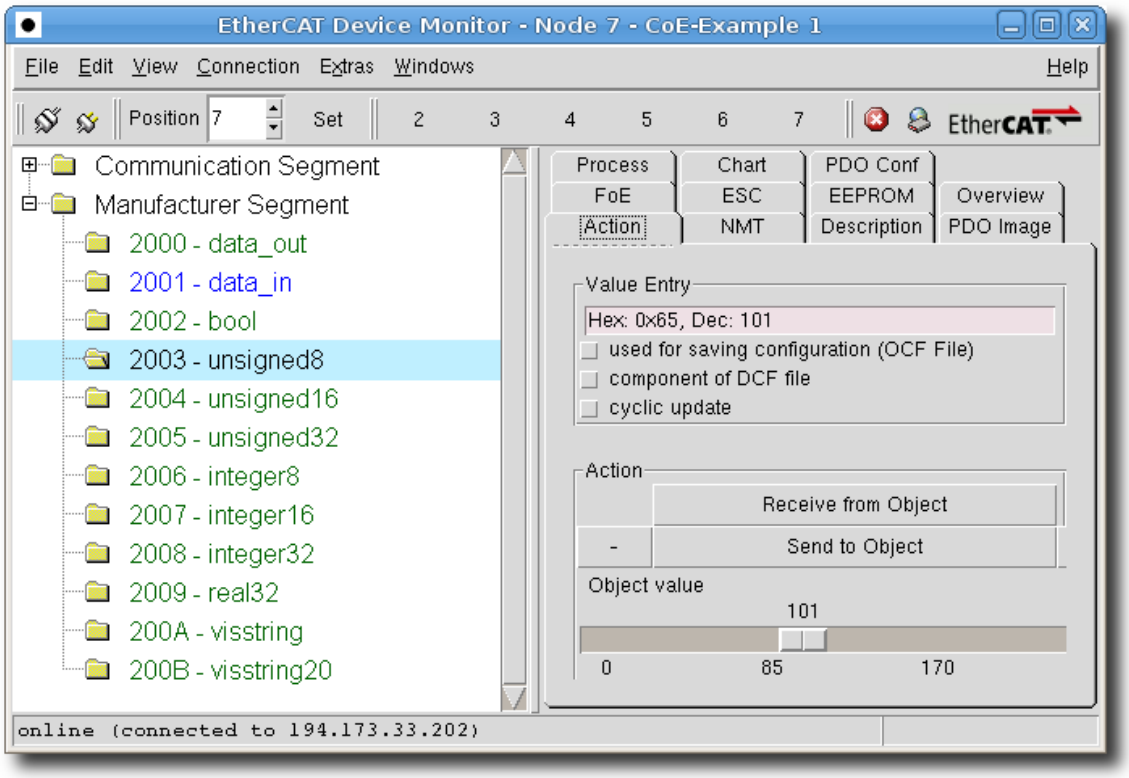


Figure 15: Tab Action

Write object

select the object in the tree

set value in Action tab→ Value Entry Frame

execute SDO transfer by Action → Send to Object

Read object

select the object in the tree

execute SDO transfer by Action → Receive from Object

the received value is shown in Action → Value Entry Frame

Because of the fact that reading an object may trigger an unwanted reaction an object is only read on request. But if Extras → Options → Read object on selection is active the selection of an object triggers the SDO transfer to read this object.

Value Entry Frame

Hexadecimal values are designated by the prefix 0x (example: 0x10).

Enter strings consisting of one or more parts without quotation marks. Spaces at the end of the string will be ignored.

Is this field empty, the value 0 will be sent.

<DEL> deletes the contents of this field.

<ENTER> sends the value.

<Shift ENTER> If an URL is in this entry, the web browser is started.

The last word of the value in the entry field is evaluated as a mathematical expression before sending it with an SDO transfer.

Try to put something like: *0x180+10* in it.

Component of DCF file

By this checkbutton the object is marked for DCF file handling (see chapter "Data Management with DCF File").

Used for saving configuration

If this check box is activated, the EtherCAT® Device Monitor marks this object for storing its value in a object configuration (*.ocf) file (see chapter "Object Data Management with ocf File").

Cyclic update

If this check box is activated, the value is read and updated cyclically. Active bit boxes and slider displaying the value of this object are updated too.

Receive from Object

The object value will be requested by SDO.

Send to Object

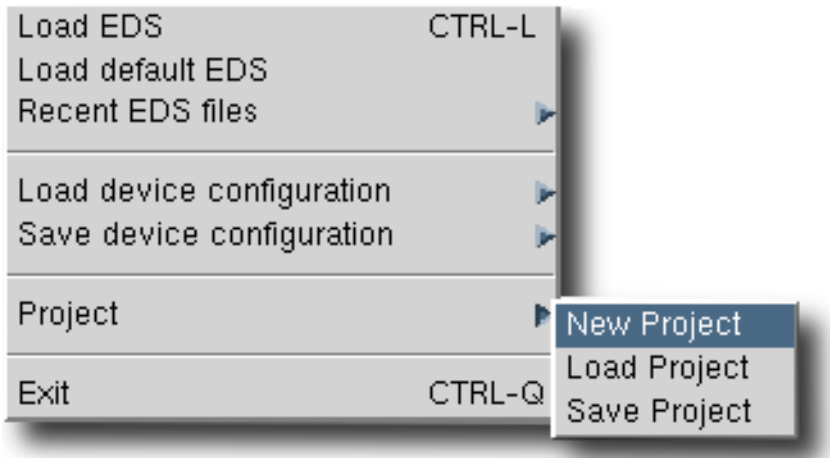
The object value will be set (written) by SDO.

\- The value in the field Value Entry Frame will be decremented by 1. Thereafter it will be sent to the device automatically.

\+ The value in the field Value Entry Frame will be incremented by 1. Thereafter it will be sent to the device automatically.

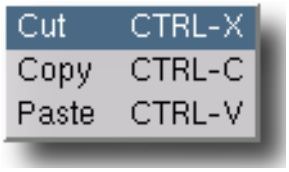
4.

4.1.



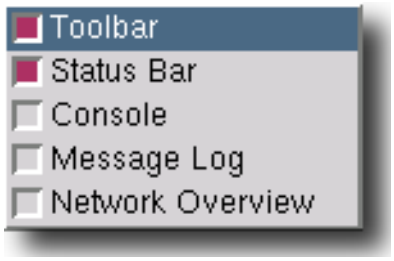
Load EDS	Loads an EDS file
Load default EDS	Loads an EDS file with mandatory objects
Recent EDS files	List of recently used EDS files
Load device configuration	Loads OCF or DCF files
Save device configuration	Saves OCF or DCF files
New Project	Starts a new project
Load Project	Loads an existing project
Save Project	Saves a project
Exit	Exits EtherCAT® Device Monitor

4.2.



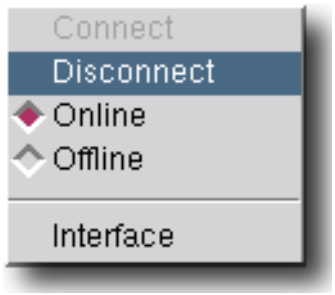
Cut	Cuts selected text into clipboard
Copy	Copies selected text into clipboard
Paste	Pastes text from clipboard

4.3.



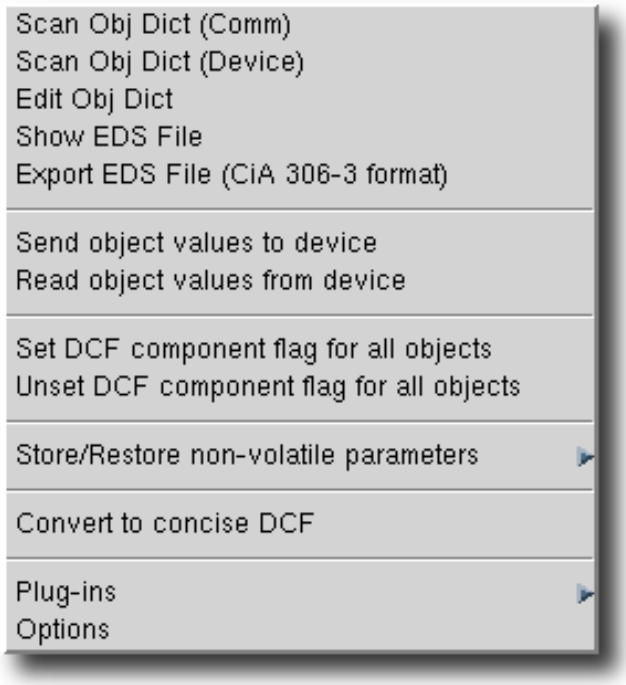
Toolbar	Toggles the view of the toolbar
Status Bar	Toggles the view of the statusbar
Console	Toggles the view of the console (only full version)

4.4.



Connect	Connects to the EtherCAT® server
Disconnect	Closes the connection to the EtherCAT® server
Online	Read and write accesses are performed directly with the device
Offline	Read and write accesses are performed with the DCF data buffer
Interface	Opens the dialog to configure the EtherCAT® interface

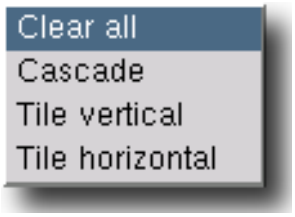
4.5.


Scan Obj Dict (Comm)
Scan Obj Dict (Device)
Edit Obj Dict
Show EDS File
Export EDS File (CiA 306-3 format)
Send object values to device
Read object values from device
Set DCF component flag for all objects
Unset DCF component flag for all objects
Store/Restore non-volatile parameters
Convert to concise DCF
Plug-ins
Options

Scan Obj Dict (Comm)	Scans the communication profile segment of the object dictionary
Scan Obj Dict (Device)	Scans the device profile segment of the object dictionary
Edit Obj Dict	Opens a simple OD-Editor. It is e.g. useful to add dynamic OD entries.
Export EDS File	Exports a scanned object dictionary as EDS file.[1]
Send object values to device	Transmits the values of all objects with DCF-component-flag to the device.
Read object values from device	Reads the values of all objects with DCF-component-flag from the device.
Store/Restore non-volatile parameters	Store or restores the configuration of the device in its non-volatile memory.
Convert to concise DCF	Converts DCF-files into the concise format
Plug-ins	Menu to load plug-ins
Options	Opens the option dialog

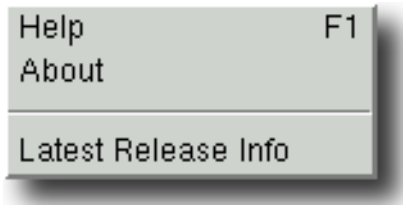
[1] The exported file can be read again by the EtherCAT® Device Monitor, but it is no complete EDS file according to the standard.

4.6.



Clear All	Clears the console and the log window	except of the main window
Cascade	Cascades all open windows	
Tile vertical	Tiles all open windows vertically	
Tile horizontal	Tiles all open windows horizontally	

4.7.



Help	Shows the on-line help
About	Shows version and licence information
Latest Release Info	Fetch information about updates from the internet

5.

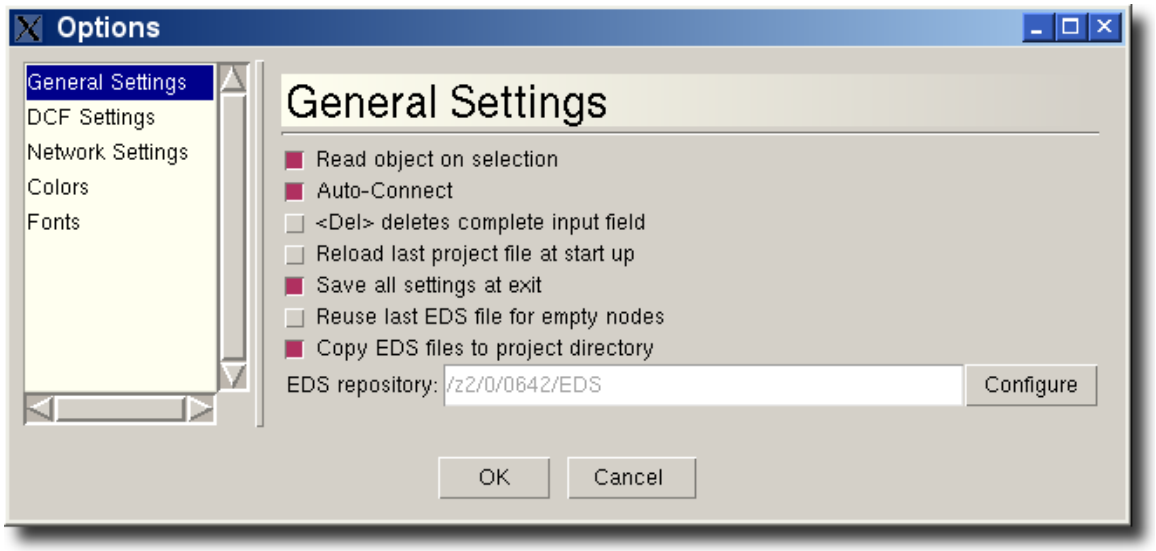
The toolbar is explained in the following illustration.

Figure 16: Toolbar

Icon	Description
Connect	Connect to EtherCAT network (EtherCAT server)
Disconnect	Disconnect connection to EtherCAT network
Position	Selection of the active node based on its position
1 ... 2 ...	Shortcut to the last active nodes
Start	Try to set all slaves into OPERATIONAL
SafeOp	Try to set all slaves into SAFE-OPERATIONAL
PreOp	Try to set all slaves into PRE-OPERATIONAL
Refresh	Re-initialization of the EtherCATserver and update of the PDO configuration of the slaves. If the PDO mapping or assignment has been changed these data have to be read again by the EtherCATserver. This might also be neccessary during the development of EtherCAT slaves. The EtherCATserver does not recognize if a CPU is stopped in the debugger but the ESC continues to work. In this case the EtherCATserver has to be re-initialized.
Abort	Stop processes that take a long time, see also `global_stop`
Query	Fetch information about updates from the internet
EtherCAT	Opens the EtherCAT page on port's website

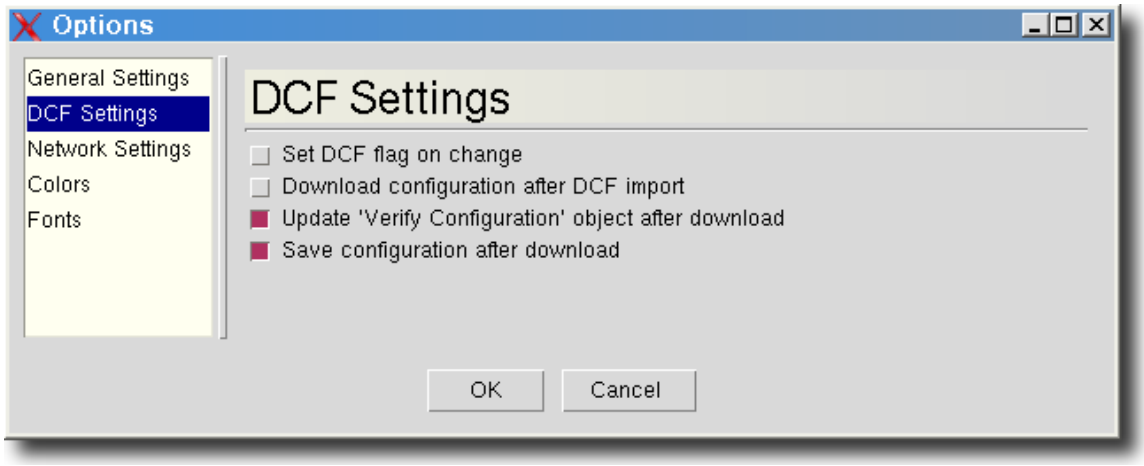
6.

6.1.



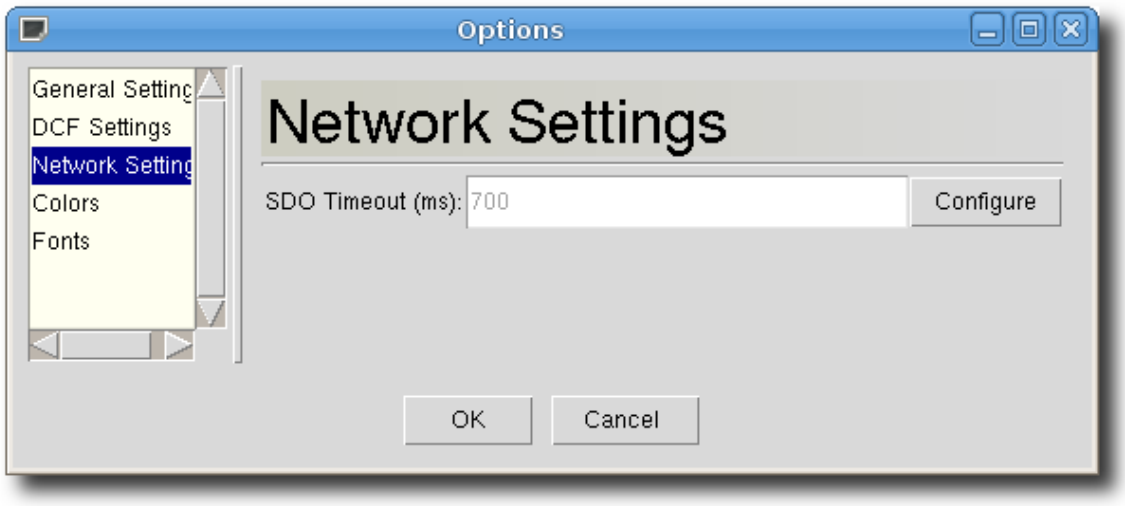
Read object on selection	*read object immediately on selection*
Auto-Connect	*Connect to server at start-up*
<Del> deletes complete entry field	*<Del> key deletes complete input field in value entry frame.*
Reload last project file at start up.	*The lastly used project file is opened automatically at start up of the EtherCAT® Device Monitor.*
Save all settings at exit	*All settings (options and connection settings) are saved automatically.*
Reuse last EDS for empty nodes	*The last EDS file is used for other node-IDs without assigned EDS file.*
Copy EDS files to project directory	*The EDS files are copied from the repository to the project folder, if it is saved.*
EDS repository	*Configuration of the directory for the EDS repository*

6.2.



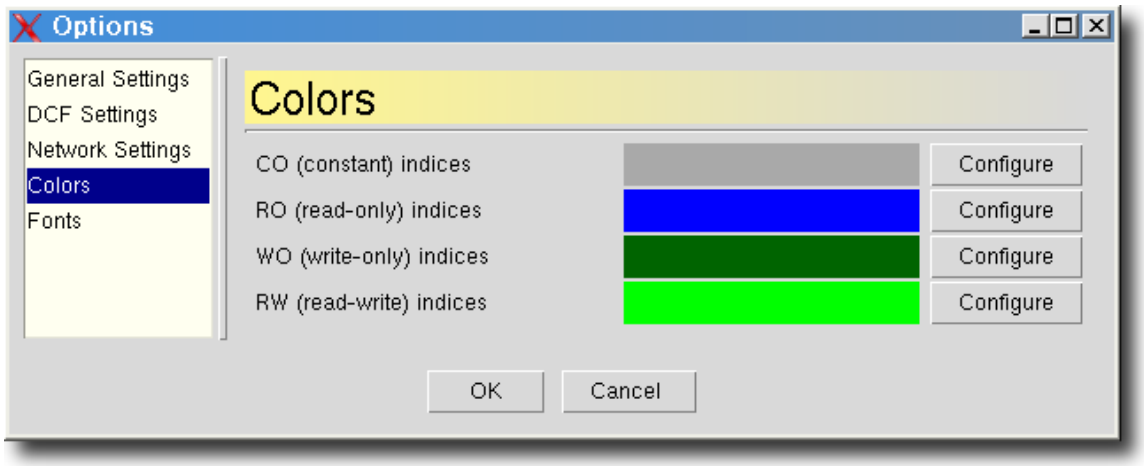
Set DCF flag on change	*sets the DCF component flag at change of an object*
Download configuration after DCF import	*Automatic download of the configuration after DCF import*
Save configuration after download	*Automatic saving of the configuration after download*

6.3.



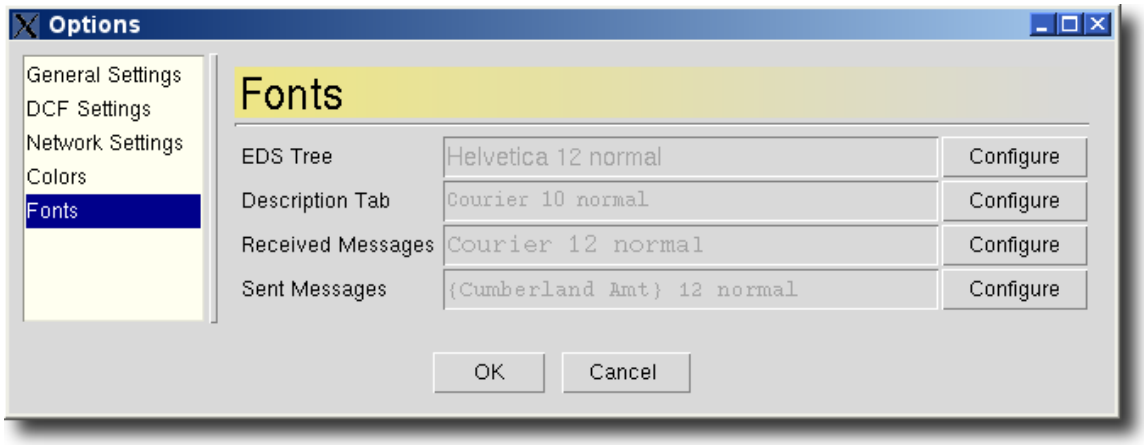
SDO Timeout (ms)	*SDO timeout in ms*
EtherCAT Cycle Time(ms)	*Cycle time of the EtherCAT network in ms*
Allow old-style OD Scan	*If scanning of the object dictionary using the service 'SDO Info' is not supported, the tool can also try to read each object by object.*
Auto re-scan of network	*Rescan of network automatically if topology has changed*

6.4.



This dialogue allows the configuration of specific colors for objects with different access types.

6.5.



This dialogue allows the configuration of specific fonts for different GUI elements.

7.

7.1.

For the execution of NMT services this tab provides some buttons:

Button	Description
Start Network	Set all nodes in the state OPERATIONAL.
Start Node	Set the node with the active node-id in the state OPERATIONAL.
Preop Network	Set all nodes in the state PRE-OPERATIONAL.
Preop Node	Set the node with the active node-id in the state PRE-OPERATIONAL.
Stop Network	Set all nodes in the state STOPPED.
Stop Node	Set the node with the active node-id in the state STOPPED.
Safe Op	Set the node into the state SAFE OP.
Init	Send the NMT command Init Node.

The control of the state machine is also possible by the console.

7.2.

By pressing the buttons "Script "1 to "Script 4" scripts with the file names script1.tcl - script4.tcl are started, if this files can be found in the current working directory or in the program directory. "Test" starts the script t_start.tcl, if it exists. Modify these scripts to match your needs and use them to automate repetitious tasks, like configurating a device. Tooltips over each button show the first line of the corresponding script file. So the first line of a script contains a comment about the content of the scripts. Additionally the last word of the first line of a script can be a valid color definition (e.g. red or #ffaa11) to modify the background color of the specific button. Within these scripts all EDM-commands are available.

This function is only available in the full version. Using the eval version only integrated demo scripts can be loaded.

7.3.

After scanning the network the buttons for the nodes get different colors.

Color	Meaning
background color	no node found
blue	node found
yellow	active node during network scan

To change the active node simply press the button with the desired node-id. If an EDS-file has been loaded already for this node, it is displayed in the EDS tree. Otherwise an EDS-file for this device can be loaded.

For all nodes different EDS files can be loaded.

7.4.

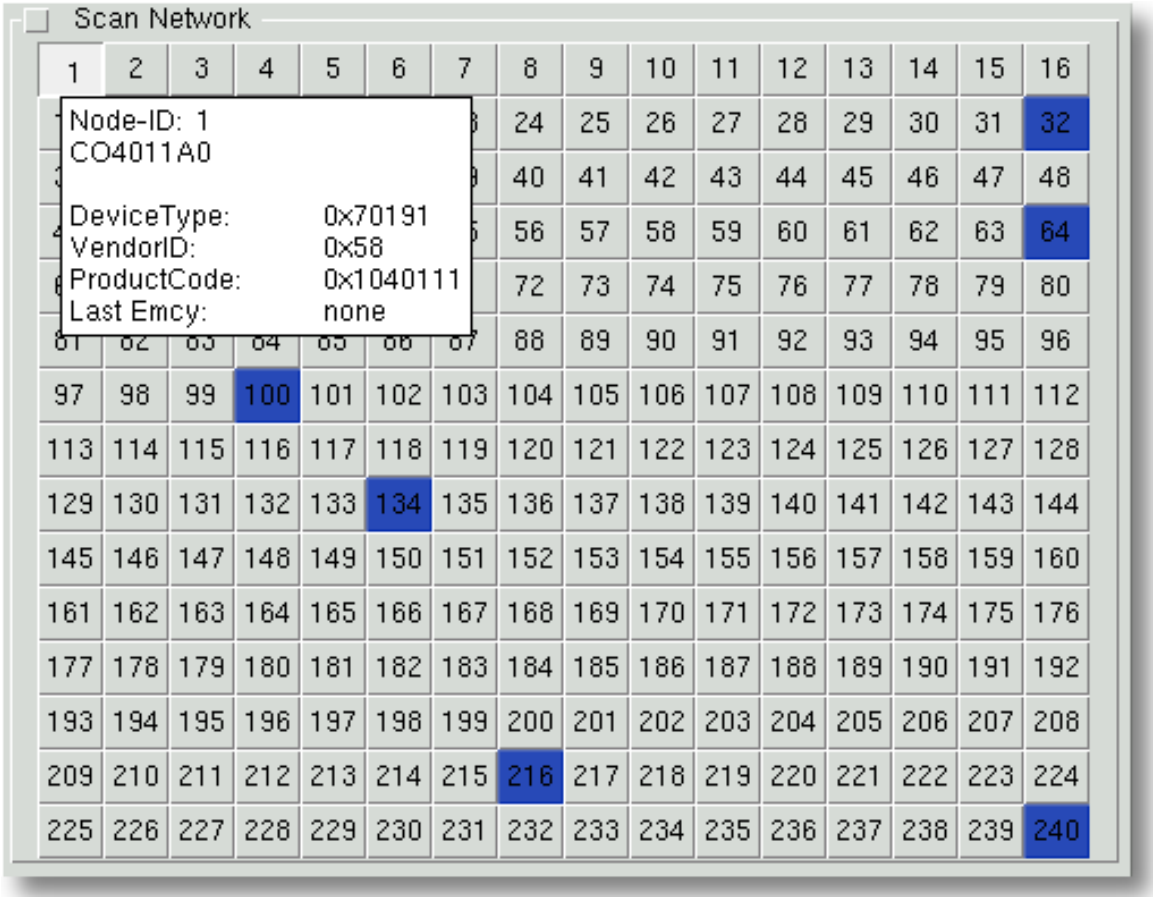


Figure 17: Device information

When moving the mouse over found nodes device information are displayed as a tool tip.

8.

8.1.

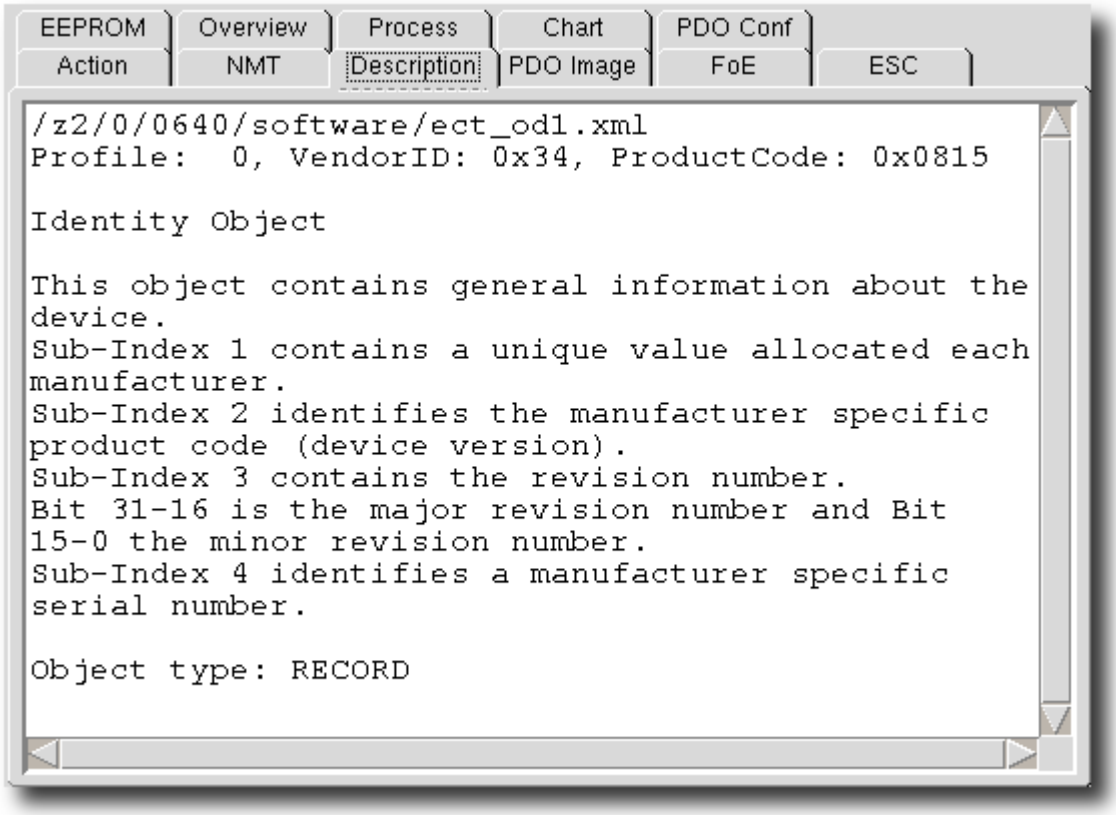


Figure 18: object description

The object description contains additional information about the selected index of the object dictionary. Beside the actual description the object code for complex objects or the data type and the default value is shown, too. The object description for each index is read from the object description file.

8.2.

Because of the restrictions of the old CANopen-based EDS format, it is not possible to add object descriptions to an EDS file. Therefore this additional information is stored in a separated object description file. See file structure below:

```
index1:
object name 1

description line 1
description line 2
description line n
```

```
index2:
object name 2

description line 1
description line 2
description line n
```

The data format for the indices is hexadecimal without leading "0x". An example object description file is `lib/ds301.txt` with descriptions for the objects from the communication profile. When an EDS file is loaded, the EtherCAT® Device Monitor looks for a file with the same name as the EDS but with the extension `.txt` If such a file is found, it is loaded as object description file for this EDS. Otherwise only the data type or the object code is displayed.

The EtherCAT® DesignTool by *port* creates object description files automatically.

9.

9.1.

With the object overview tab all sub indices of an array or record an be read or written at once.

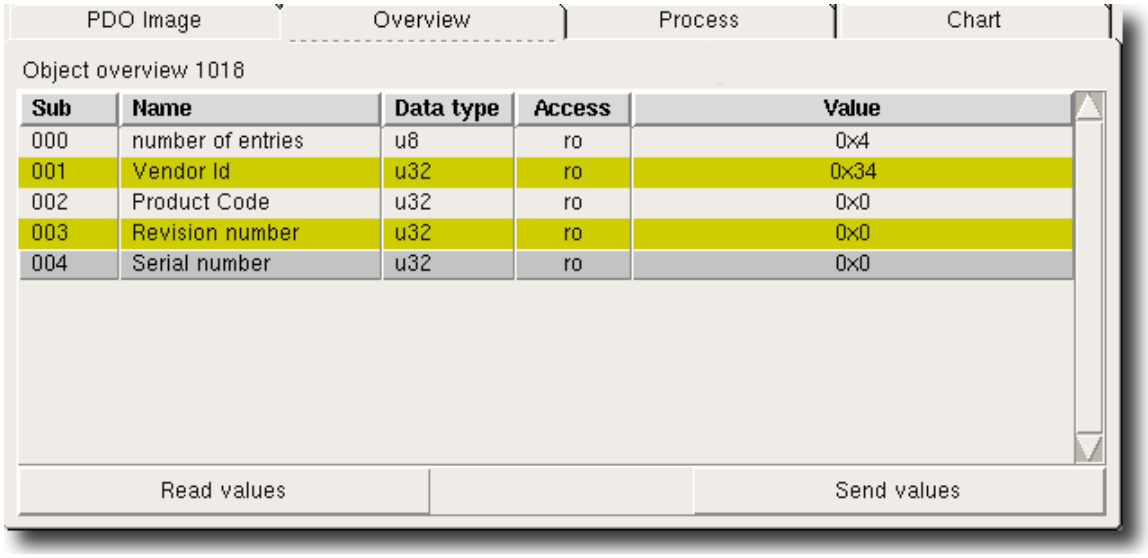


Figure 19: Index overview

Some rescritions exist when reading or writing sub indices. Sub indices with the data type "domain" cannot be read or written and PDO and PDO mapping cannot be written from the overview tab. For these objects it is required to meet a specific order when writing to them, but they can be configured by the PDO configuration tab.

10.

The PDO tab simplifies the configuration of PDOs. At the selection of a PDO object in the EDS tree, the mask is updated with values from the EDS. The PDO parameters simply can be adjusted over the mask. New objects can be moved from the EDS tree into the mapping table by drag&drop. A double click deletes them within the mapping table. The table is unalterable at a static mapping.

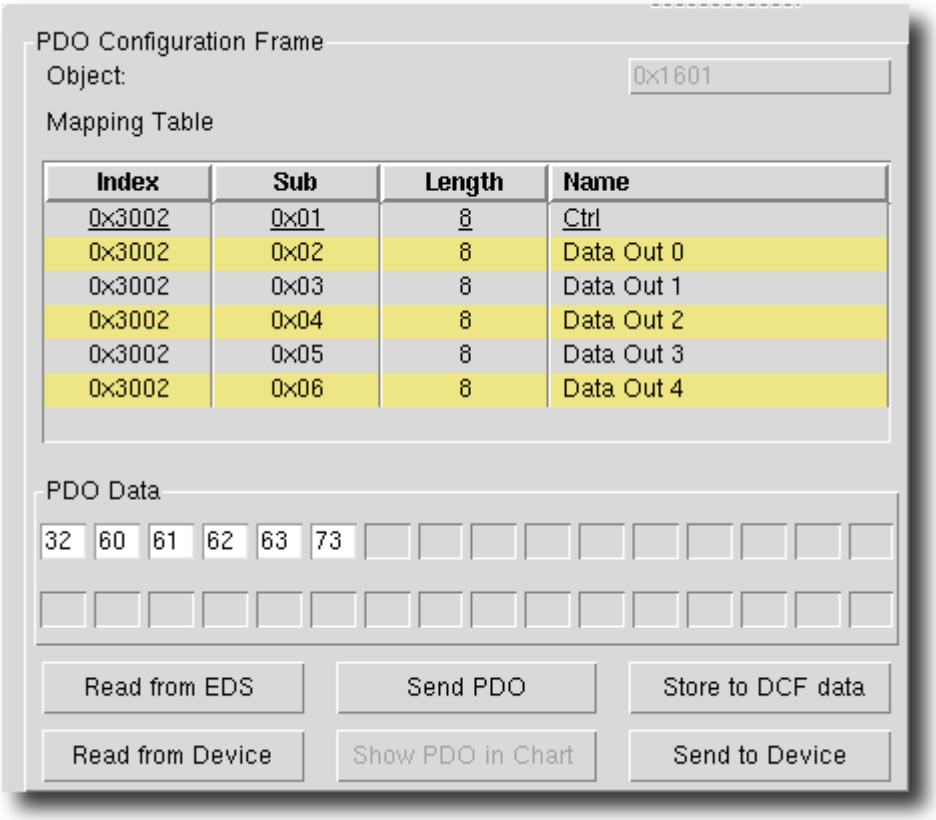


Figure 20: PDO Tab

After a modification of the PDO mapping or PDO assignment, the network PDO configuration has to be updated by clicking at the icon "Reload Network Configuration" in the toolbar. This is necessary to use the modified PDOs.

The following table describes the buttons in the lower part of the mask.

Option	Description
Read from EDS	Reads the values from the EDS file
Read from Device	Reads the current values from the device
Send to Device	Transfers the entered values to the device
Store to DCF data	Store the entered values into the DCF data buffer
Send PDO	Sends the current PDO to the device. The values of the PDO are taken from the entries above. Take into account that PDOs only can be sent or received in the state OPERATIONAL. Only at RPDOs of the device.
Show PDO in Chart	A PDO Indication function is configured so that the values of this PDO are displayed in the chart Tab. The device must be configured correspondingly before. Take into account that PDOs only can be sent in the state OPERATIONAL by the device. Only at TPDOs of the device.

10.1.

After pressing the button "Show in Chart" the following dialog window is opened.

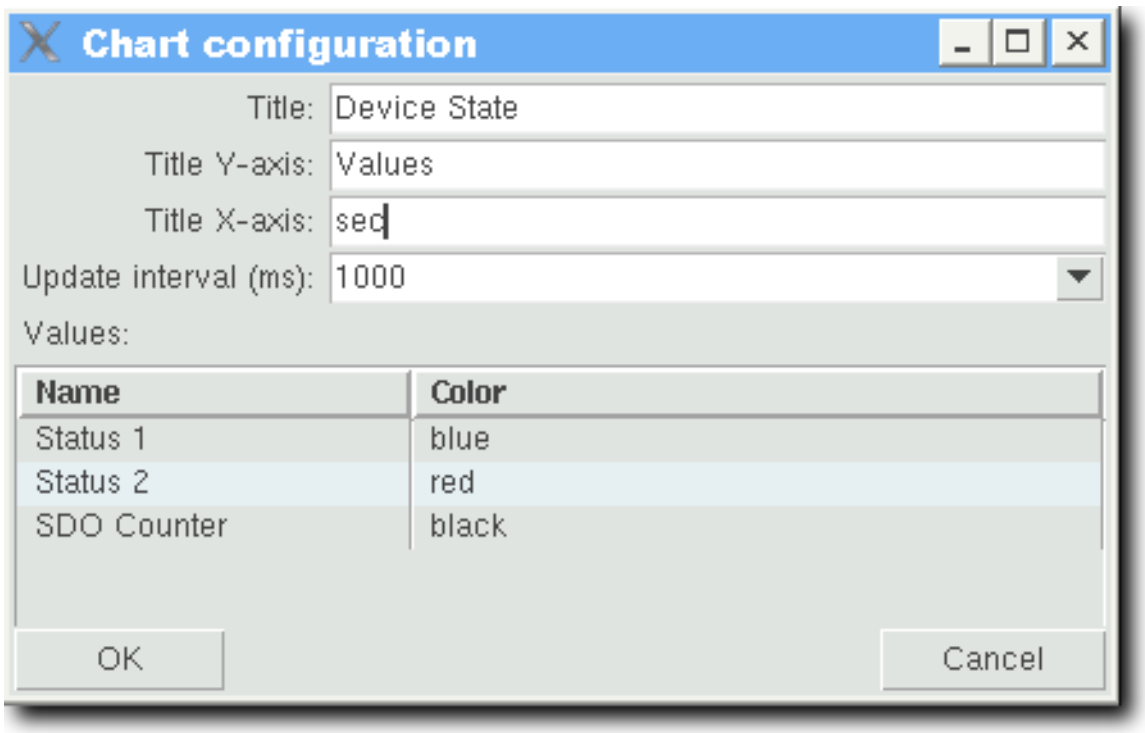


Figure 21: Chart configuration mask

The title of the chart and of the axes and the names of the data can be configured there.

If the **update interval** is not 0, the chart is updated by a time-trigger mechanism. I.e. arriving data are written into a buffer and after a certain amount of time the values of the buffer are displayed in the chart. If the update interval is 0, the chart is updated at every arriving PDO. It it's an asynchronous PDO, the information about the time of the arrival of the data is lost.

At **Color** the color of a signal can be configured. Every color that is supported by Tcl/Tk can be used. Otherwise the colors can be specified in hexadecimal notation like #ffaa11.

11.

The process image Tab serves the observation of process quantities of different nodes. The values of the individual objects are queried and updated cyclically by SDO every 1000 ms (per default). Normally, the values are read only if the tab is active. To update the values in every cycle, activate *Update even in background*.

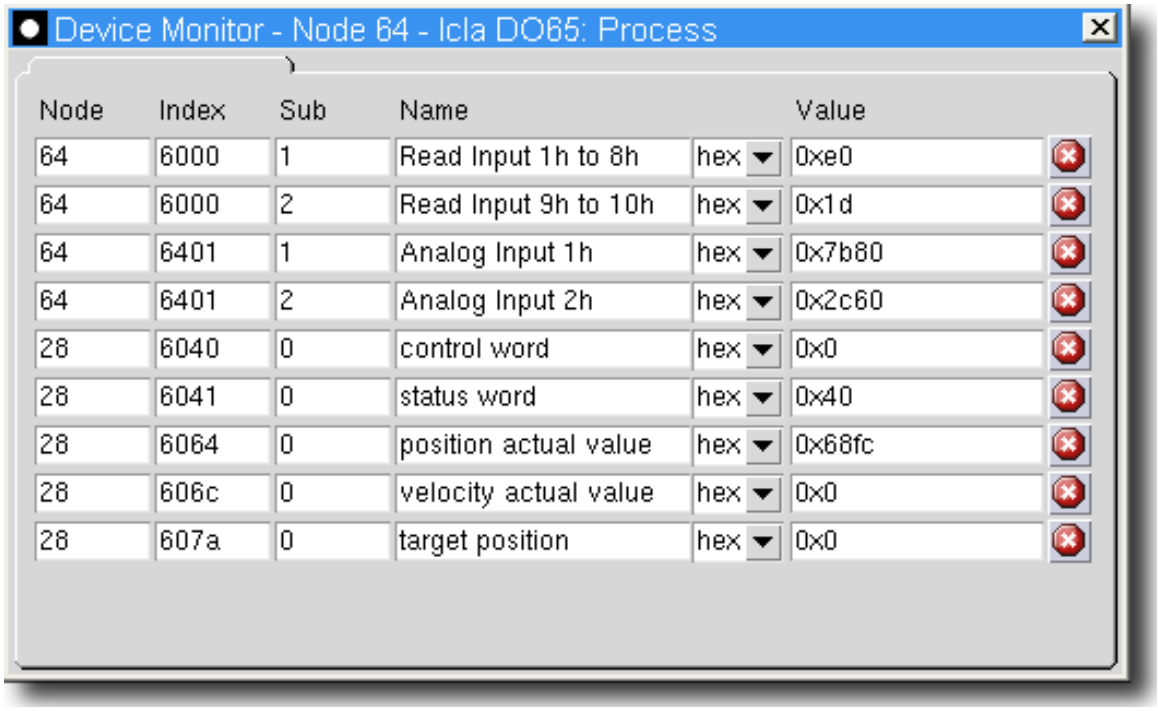

Device Monitor - Node 64 - Icla DO65: Process
Node
Index
Sub
Name
Value
64 6000 1 Read Input 1h to 8h hex 0xe0
64 6000 2 Read Input 9h to 10h hex 0x1d
64 6401 1 Analog Input 1h hex 0x7b80
64 6401 2 Analog Input 2h hex 0x2c60
28 6040 0 control word hex 0x0
28 6041 0 status word hex 0x40
28 6064 0 position actual value hex 0x68fc
28 606c 0 velocity actual value hex 0x0
28 607a 0 target position hex 0x0

Figure 23: Process image

Add single objects by Drag & Drop from the EDS tree. The small button besides the value of the object serves for deleting. Whole arrays or records can be added by adding the main index. The display format (hexadecimal, decimal, binary or ASCII) can be configured at the combobox in front of the value. It is ignored by string values.

The settings of the process image can be saved with the complete EtherCAT® Device Monitor project via "File → Project → Save Project". When the project is opened again, the process image settings are restored.

12.

The PDO Process Image tab displays the data of TPDOs from the EtherCAT® network.

There are 2 ways to add Transmit PDOs of the EtherCAT® nodes to the PDO process image:

- Drag&Drop the PDO object from the object tree into the PDO process image
- via the button "Add to PDO Image" in the PDO configuration tab.
  To delete all PDOs press the right mouse button and select Clear PDO Process Image
  This also resets the PDO settings in the EtherCAT® server.

The display of the data is updated every 1000 ms when the PDO process image tab is active. To update the values even when the tab is not visible, activate *Update even in background* .

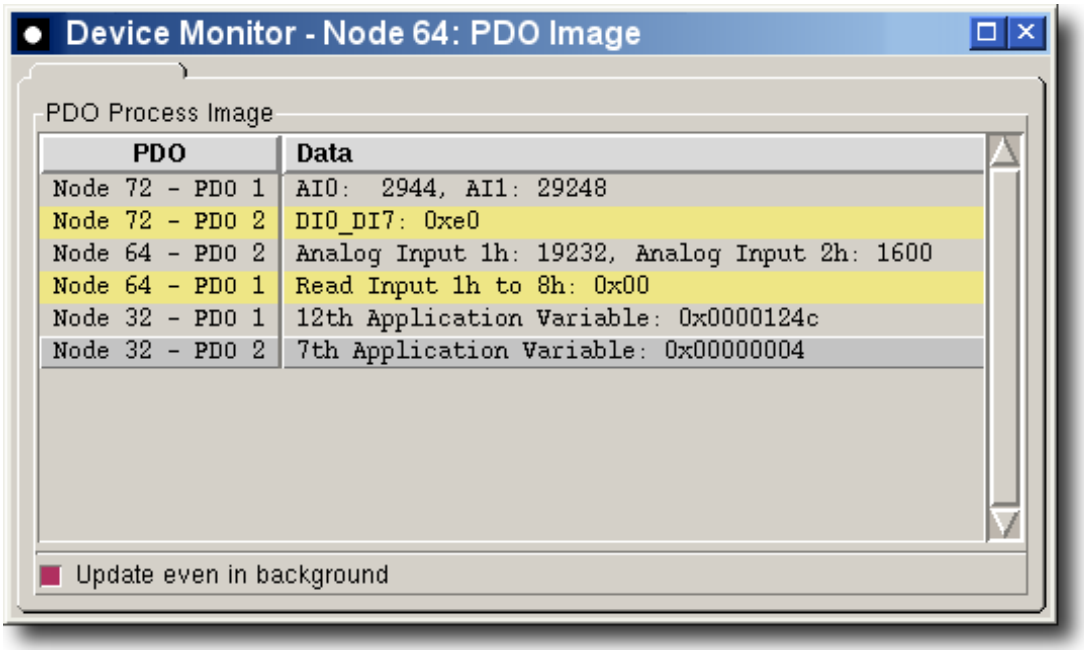

Device Monitor - Node 64: PDO Image
PDO Process Image
PDO
Data
Node 72 - PDO 1
AI0: 2944, AI1: 29248
Node 72 - PDO 2
DI0_DI7: 0xe0
Node 64 - PDO 2
Analog Input 1h: 19232, Analog Input 2h: 1600
Node 64 - PDO 1
Read Input 1h to 8h: 0x00
Node 32 - PDO 1
12th Application Variable: 0x0000124c
Node 32 - PDO 2
7th Application Variable: 0x00000004
Update even in background

Figure 24: PDO Process image

The settings of the process image can be saved with the complete EtherCAT® Device Monitor project via File → Project → Save Project When the project is opened again, the process image settings are restored.

13.

Using the EtherCAT service "File over EtherCAT (FoE)" files of an arbitrary size can be transfered from or to EtherCAT devices. The FoE tab is only active, if the selected device supports the FoE service. Otherwise it is disabled.

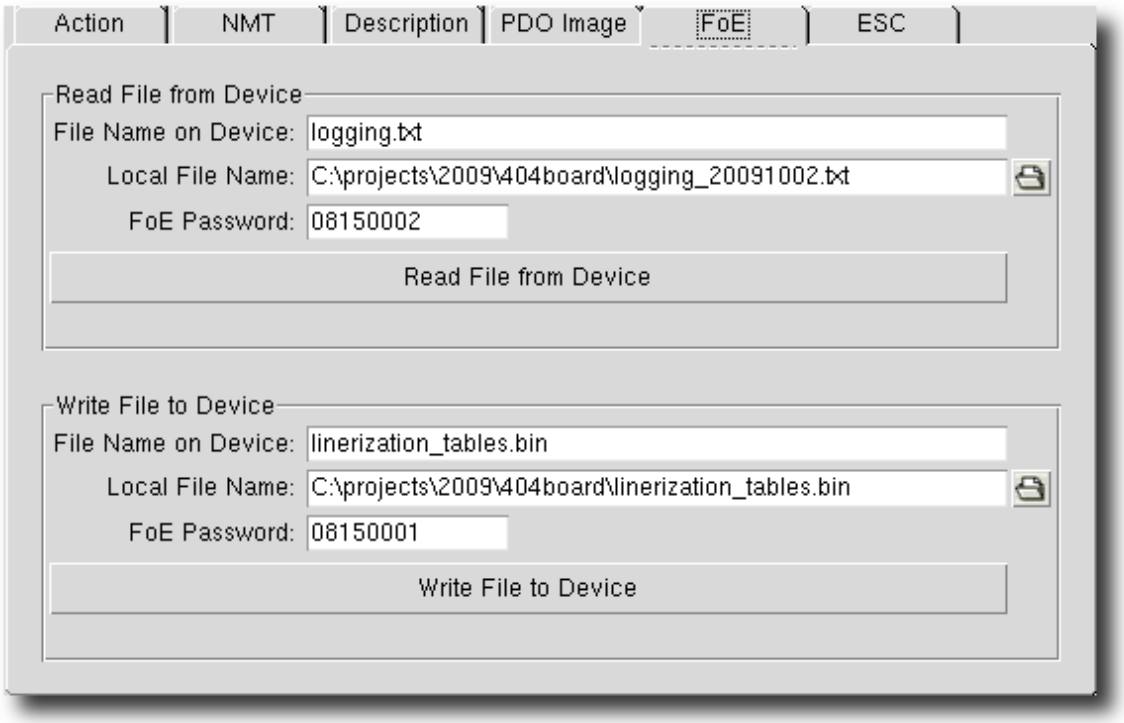


Figure 26: FoE Tab

The FoE tab consits of 2 parts. The upper part controls reading files from the device and the lower part controls writing files to the device. For both services the same set of parameters is required: A file name for the local file on the PC, a file name on the device and a password to enable the FoE access on the device. The password must be a 32-bit hexadecimal value as e.g. `0123ABCD`.

The file transfer may take a noticeable time especially when transfering large files. The process is indicated using a progress bar and the EtherCAT® Device Monitor is locked during this time.

To use FoE services from scripts the functions `::foe::readFile <deviceFileName> <password> <localFileName>` and `::foe::writeFile <deviceFileName> <password> <localFileName>` can be used.

14.

The EtherCAT® Device Monitor supports reading and writing of registers of the EtherCAT Slave Controller(ESC). By pressing the "Read ESC" button 512 bytes from the ESC are read starting at the specified start address.

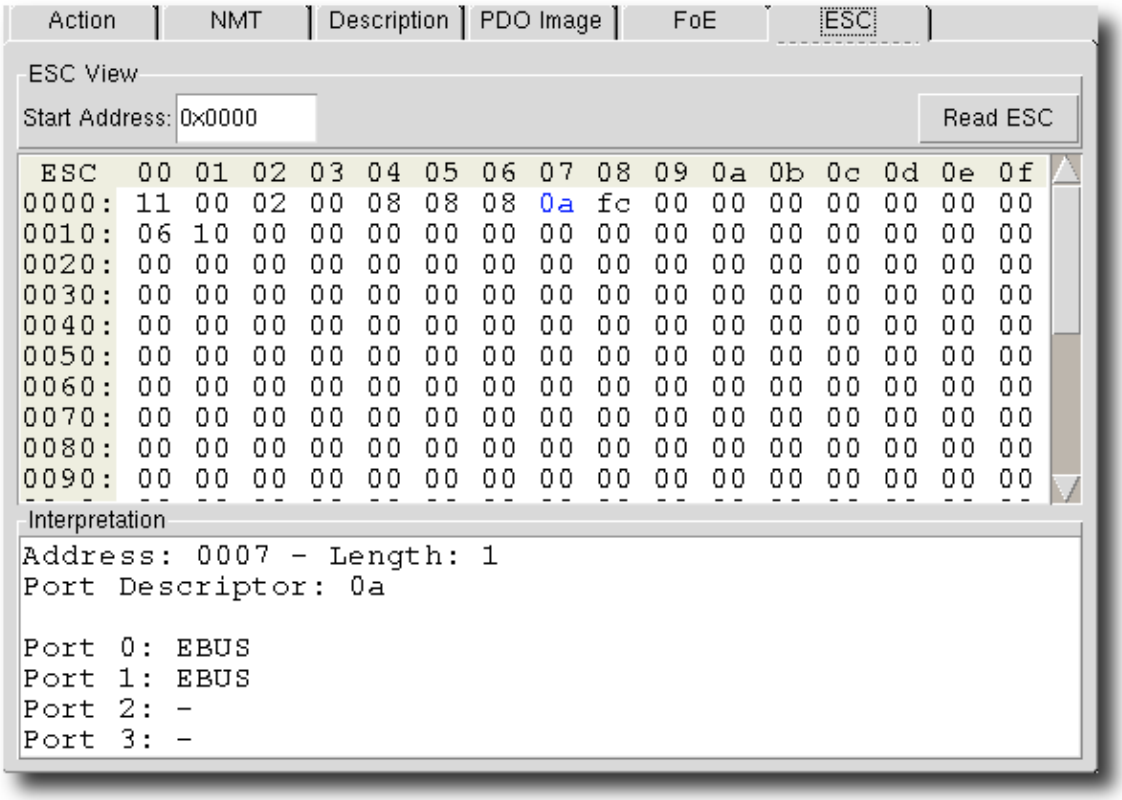


Figure 27: ESC Tab

A register of the ESC can be interpreted by highlighting a byte in the raw register view. Thereafter the interpretation of this register is shown in the field at the bottom of the tab.

To use the ESC services from scripts the functions `::esc::regRead <addr>` and `::esc::regWrite <addr> <value>` can be used.

15.

The EtherCAT® Device Monitor supports reading and writing of data of the EEPROM. By pressing the "Read EEPROM" button 512 words from the EEPROM are read starting at the specified start address.

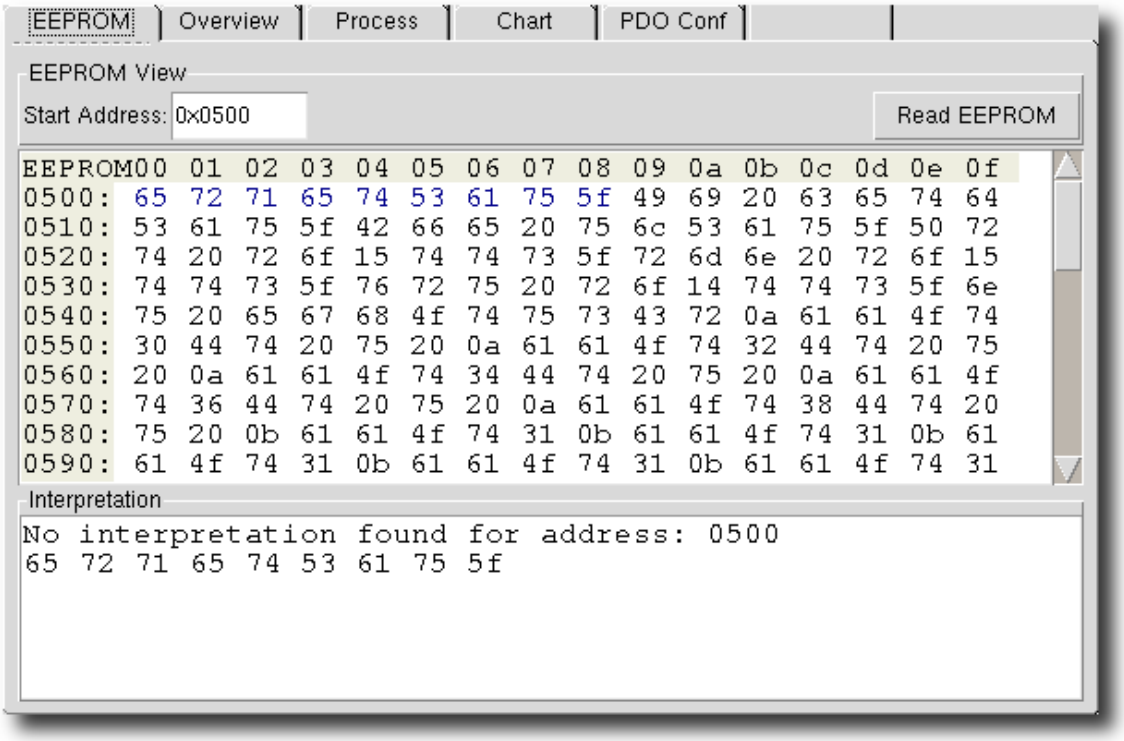


Figure 28: EEPROM Tab

To use the EEPROM services from scripts the functions `::eeprom::siiRead <addr>` and `::eeprom::siWrite <addr> <value>` can be used.

16.

For data visualization the pre-installed **Chart** tab can be used. It shows as an example the usage of a strip-chart.

After opening the **Chart** tab, a strip-chart is displayed. Besides for the visualization of PDO data, it can be also used by scripts. Values are given to it by calling the Tcl-procedure `::edm::addChartData`. The procedure is defined as follows:

```
proc ::edm::addChartData { valueList } {
    # add new values to the strip-chart window
}
```

`valueList` contains a list of values for the strip-chart:

```
(EDS) 9 % ::edm::addChartData {1 2 3 }
(EDS) 10 % ::edm::addChartData {-1 -2 -3}
```

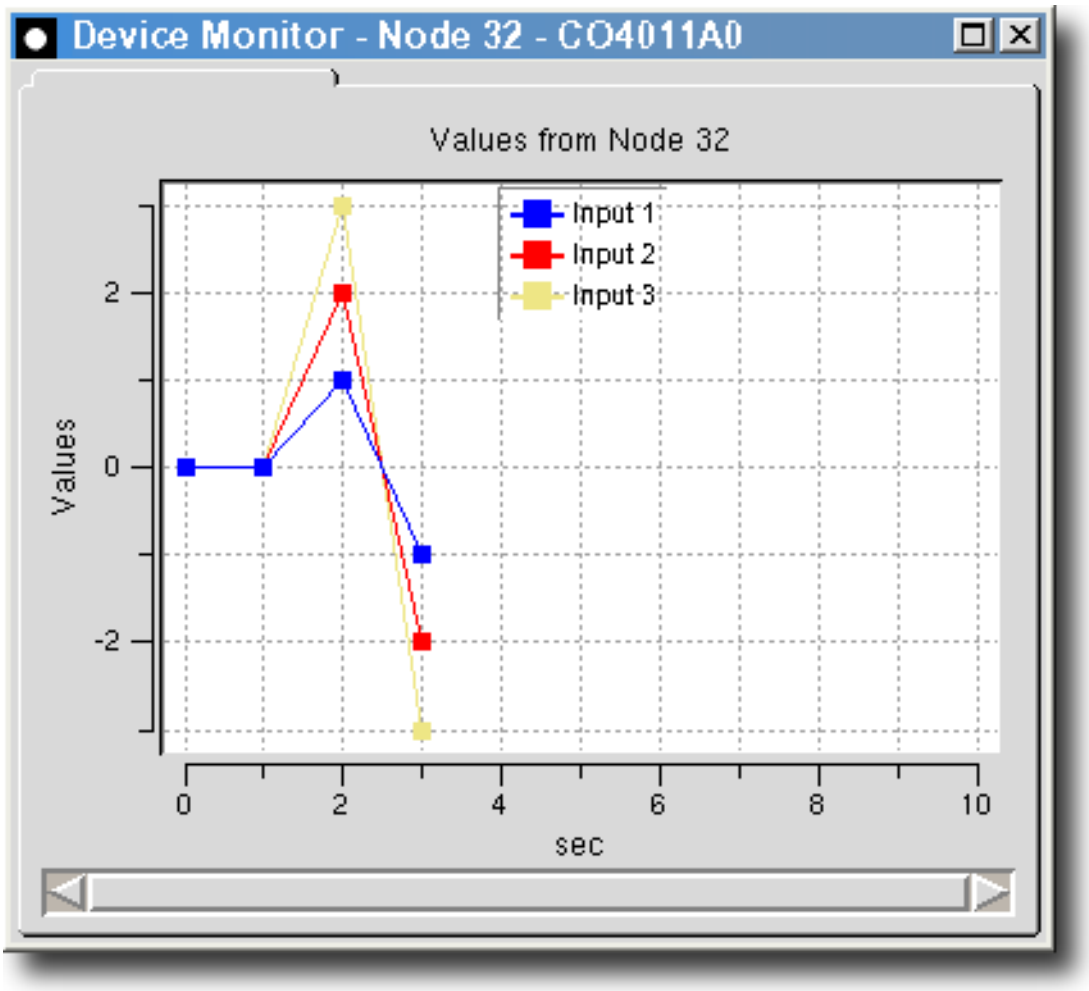


Figure 29: strip-chart after two calls to `::edm::addChartData`

With little effort you can write your own simple script that reads values from a device and displays them in the chart.

```
% proc readAndShow { index sub dataType } {
    set value [r $index $sub $dataType]
    edm::addChartData [list $value 0 0 0]
}
%
% # Call this procedure every second
% ::common::every "readAndShow 0x6401 0x01 i16" 1000
%
```

Windows -> Clear All , `::edm::clearChart` or F7 clears the chart and the <space> key pauses the display.

The console or script command `::edm::saveChart <fileName>` saves the content of the chart to a postscript file.

The chart can be zoomed by the right resp. left mouse button.

The context menu provides the following actions:

Menu entry	**Description**
Clear Chart	Deletes all values from the chart.
Save Chart	Saves the current picture as PostScript file.
Save Data	Saves all vales as CSV file.
Stop Updating	Stops the update of the chart

17.

17.1.

Optionally the tabbed field Action can be extended by further elements. A possible element is a slider (Figure 30).

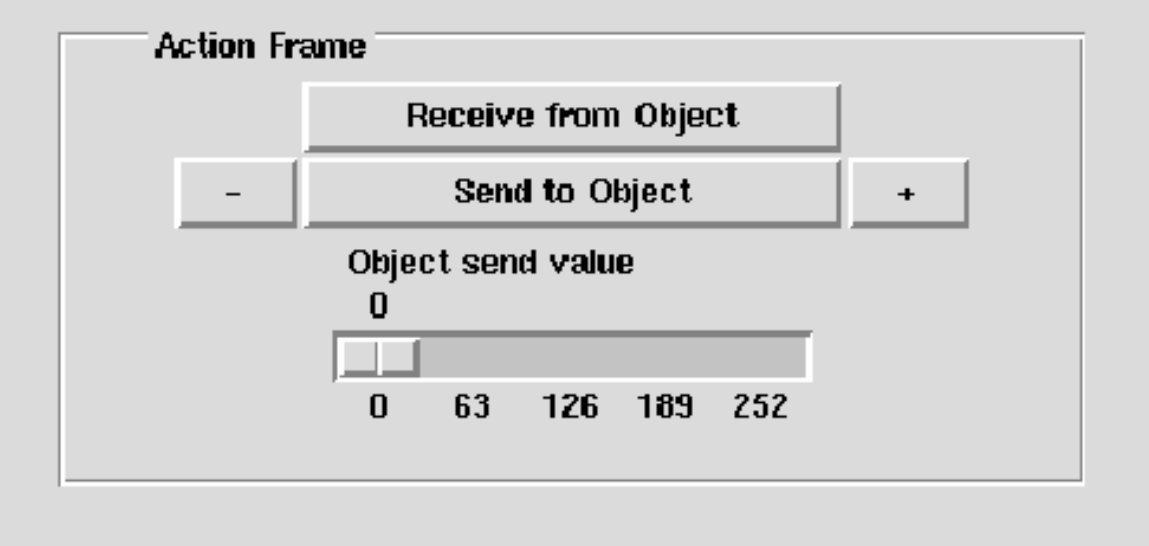


Figure 30, Tabbed field Action with slider

A slider consists of a regulator and a scale. The regulator is moving. For operating use the following keys:

- If the left mouse button is pressed in the trough, the scale's value will be incremented or decremented by the value of the resolution option so that the slider moves in the direction of the cursor. If the button is held down, the action is repeated.
- If the left button is pressed over the slider, the slider can be dragged with the mouse.
- If the left button is pressed in the trough with the control key down, the slider moves all the way to the end of its range, in the direction towards the mouse cursor.
- The 'up' and 'left' cursor keys move the slider by one to left.
- The 'down' and 'right' cursor keys move the slider by one to right.

Further a storage of the object values with the option *used for saving configuration* is possible.

17.2.

A slider in a top level window can be assigned to an object. This window stays at the desktop even if other objects are selected in the tree structure.

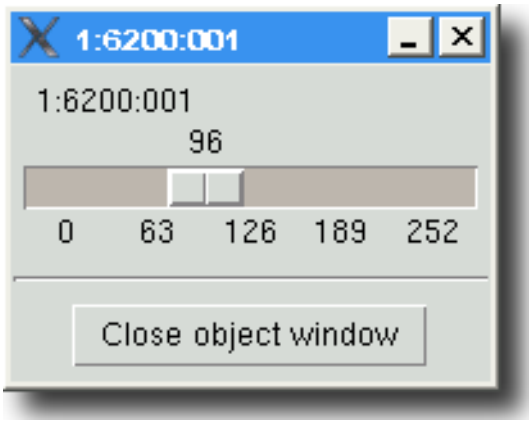


Figure 31: Slider in a top level window

The slider actions are the same as described for the Action tab slider above.

Close object window

The top level window can be closed by selecting the button labeled with "Close object window"

17.3.

Each numerical object can be displayed bitwise in a unique window.

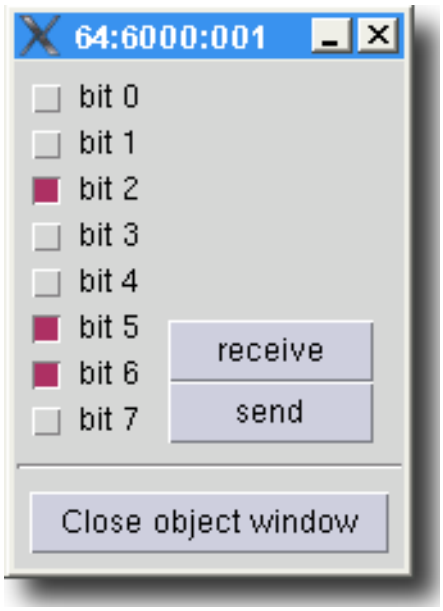


Figure 32: Bit box in a top level window

All object extension can be activated by pressing the right mouse button in the object tree.

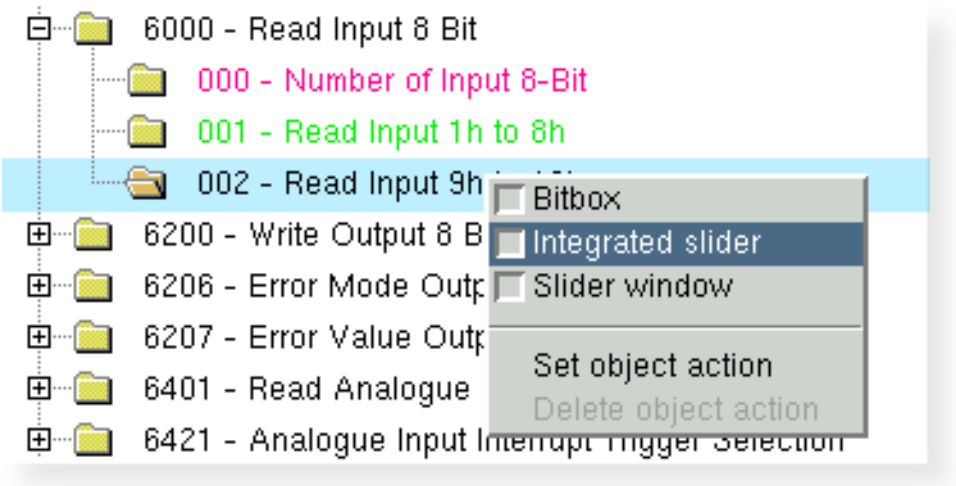

6000 - Read Input 8 Bit
000 - Number of Input 8-Bit
001 - Read Input 1h to 8h
002 - Read Input 9h
6200 - Write Output 8 B
6206 - Error Mode Outp
6207 - Error Value Outp
6401 - Read Analogue
6421 - Analogue Input
Bitbox
Integrated slider
Slider window
Set object action
Delete object action

Figure 33: Configuration of the GUI Extension

The assignment of slider and bit boxes to particular objects can be saved in a OCF file.

18.

In addition to the predefined tabbed fields (or "tabs") at the right side it is possible that you add your own tabbed fields to EtherCAT® Device Monitor.

There are 2 kinds of tabs available:

- User specified tabs with support of tests
- User specified tabs without contents

18.1.

One of an additional tab is also predefined but only installed on request. It is used to organize test scripts to be controlled by the EtherCAT® Device Monitor. It provides lists of check-boxes for the user defined test scripts.

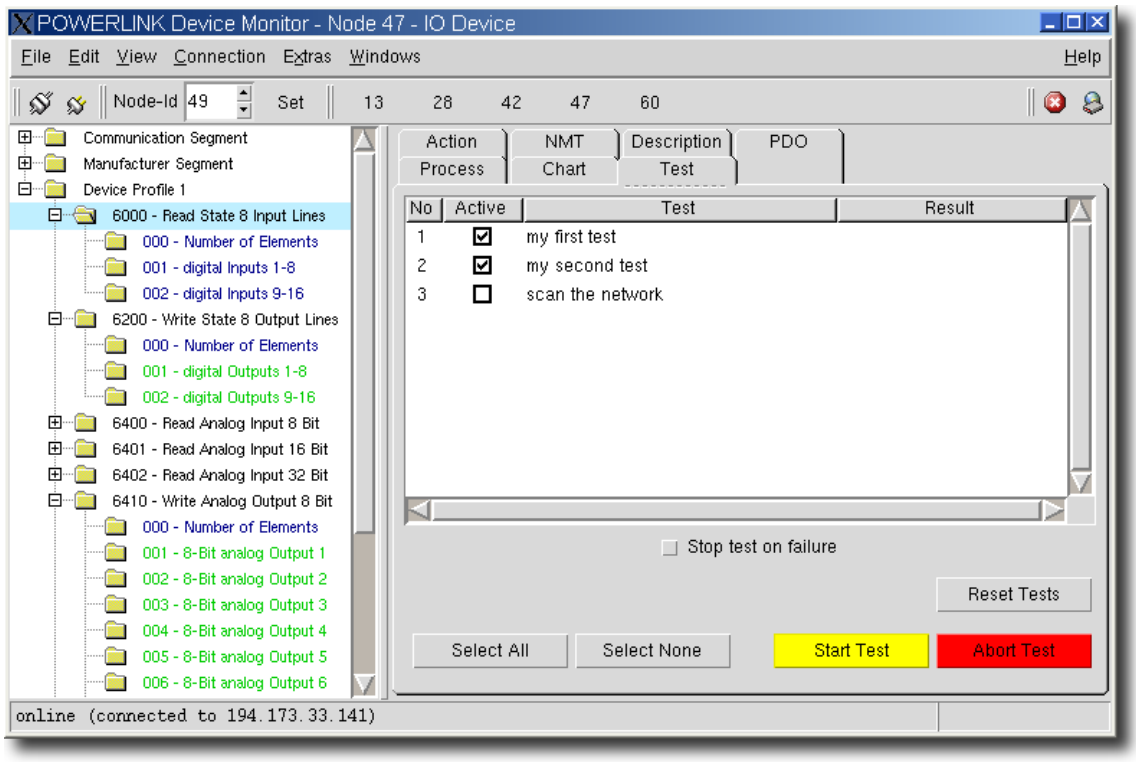

POWERLINK Device Monitor - Node 47 - IO Device
File Edit View Connection Extras Windows Help
Node-Id 49 Set 13 28 42 47 60
Communication Segment
Manufacturer Segment
Device Profile 1
6000 - Read State 8 Input Lines
000 - Number of Elements
001 - digital Inputs 1-8
002 - digital Inputs 9-16
6200 - Write State 8 Output Lines
000 - Number of Elements
001 - digital Outputs 1-8
002 - digital Outputs 9-16
6400 - Read Analog Input 8 Bit
6401 - Read Analog Input 16 Bit
6402 - Read Analog Input 32 Bit
6410 - Write Analog Output 8 Bit
000 - Number of Elements
001 - 8-Bit analog Output 1
002 - 8-Bit analog Output 2
003 - 8-Bit analog Output 3
004 - 8-Bit analog Output 4
005 - 8-Bit analog Output 5
006 - 8-Bit analog Output 6
Action NMT Description PDO
Process Chart Test
No Active Test Result
1 my first test
2 my second test
3 scan the network
Stop test on failure
Reset Tests
Select All Select None Start Test Abort Test
online (connected to 194.173.33.141)

Figure 29: User Defined Tabbed Field with Test Scripts

An example can be found in the directory "<working directory>\demo_t\".

Configuration of the predefined tab for test organization is done by configuration files

- "<working directory>\demo_t\t_start.tcl" and
- "<working directory>\demo_t\t_<conf1...n>.tcl".

The file "<working directory>\demo_t\t_start.tcl" configures all preconditions for testing. It also defines all additional tab using the command `edm::addTestTab`. Figure 29 shows an example for an additional tab.

`edm::addTestTab t_conf {<tab_name>}`

Description

Creates an additional tab on the right side of the EtherCAT® Device Monitor. It is predefined for organizing test scripts. It contains a widget with several check-boxes for selecting test scripts. Number and names of the check-boxes are read from the configuration file "<working directory>\<t_conf1..n>". Additional buttons are available for starting, stopping and global selection of test scripts.
If *tab_name* is not given, the name is built as "Test#" counting from 1 for each new tab.

Parameters:

t_conf	name of the file containing the names of the test scripts defaults to `t_files`
tab_name	name for labeling the tab

Return:

internal name of the tab

Format of the <working directory>\t_files:
Lines beginning with '#' are comments and are ignored. Each line describes one additional check-box:

```
<script>.tcl        {<label>}   {Tcl procedure name}
```

script.tcl	Name of the Tcl script that is to be executed
label	Name label for the check-box
Tcl procedure name	Tcl procedure that carries out the test. If the test was completed successfully the procedure shall return '0'. Any other return value means an error occured. If the procedure has a parameter the test description from the `t_files` is passed in this parameter.

Script name, label and Tcl procedure are separated by space or tab.

In addition special Tcl procedures can be registered for Start of a test run, Abort of a test run, Error of a test and End of a test run. The Tcl procedures are specified as follows and are only executed for the test tab they were specified for:

```
@start <Tcl Procedure>
@abort <Tcl Procedure>
@error <Tcl Procedure>
@end   <Tcl Procedure>
```

EXAMPLE:
Two additional tab are created. The first is named with the default name "Test" the second one gets the name "Some Test". Both tabs are assigned different example scripts. Figure 29 shows the result.

t_start.tcl:

```
# add the test selection frames
# use standard values for the file (t_files) and name (Test)
edm::addTestTab
# use user-defined values for the file (t_files2) and name (Some Tests)
edm::addTestTab t_files2 {Some Tests}

proc my_startHandler { args } {

    cdm::banner
}

proc my_stopHandler { args } {

    puts "\n\n\n\n------------------------"
    puts "     date / sign"
    puts "\n================= E N D ================================\n"
}
```

t_files:

```
# the first set of test scripts using the standard filename
#
@start my_startHandler
@stop  my_stopHandler

t_myfirst.tcl   {my first test}   my_1st_test
t_mysec.tcl     {my second test}  my_2nd_test
# scanning the network for EtherCAT® devices
t_scan.tcl      {scan the network} scan_test
```

t_files2:

```
# all testfiles for the second set of tests
# comments allowed after #
#
# Here we do not specify start and stop handlers
#   so they won't be called.
t_scan.tcl      {scan the network}  scan_test
t_myfirst.tcl   {my first test}     my_1st_test
t_mysec.tcl     {my second test}    my_2nd_test
t_mythird.tcl   {another}           my_3rd_test
```

t_myfirst.tcl

```
#
# Write Heartbeat Producer and check if value can be read back.
#
#
proc my_1st_test { args } {

    wwc 0x1017 0 u16 1000 OK
    if { $::global_stop == "") } {
        return "Canceled
    }
    rrc 0x1017 0 u16 1000

    return 0
}
```

The tabs are visible after loading the file with the tab specification. Loading can be done via the menu File → Load File → t_start.tcl or by issuing the `source` command in the Console:

```
$ source t_start.tcl
```

Once after loading the new tab, any changes at the files "<working directory>\t_start.tcl" and "<working directory>\t_<t_conf1...n> are only recognized and valid after a restart of the EtherCAT® Device Monitor and reloading of "<working directory>\t_start.tcl".

The tabs for testing contain the following additional control buttons:

Select All
: mark all scripts for execution

Select None
: deselect all check-boxes, remove all scripts from execution

Start Test
: start loading and executing of the selected test scripts

Abort Test
: stop execution of test scripts
Normally the execution stops at the end of the currently running script. If a running script has to abort immediately, it must do some preperations. The script must look for the state of the global variable *global_stop*. If the "Abort Test" button is selected the value of *global_stop* is set to 1. The script on the other side must not block the User Interface event loop so that the user is be able to select the Stop button. Therfore the Tcl function `update` must be called regularly.

EXAMPLE:
Template for testing *global_stop* in test scripts

```
# global variables
global global_stop

# initialize global variables
set global_stop ""

# execute application
while { ($global_stop == "") } {
    .
    .
    # read actual value of global_stop
    # and update the GUI
    update
}
```

18.2.

A new tab will created by the following command:

`edm::addTab {<title> <pos>}`

Description

creates an additional empty tab

Parameters:

title	name of the tab
pos	position of the tab in the display default: append as last tab

Return:

internal name of the tab

The empty tab can be designed by the application by input of Tcl commands at the Console or by Tcl scripts.

EXAMPLE:

```
# Create an empty tab at position 0 with the title "Service".
set name [edm::addTab Service 0]

# Create a button in the center of the bottom of the tab with the
# name "OK".
button $name.button -text "OK" -command {w 0x1017 0 u16 500}
pack $name.button -side bottom -anchor center
```

18.3.

Tab-set can be deleted with the command:

`edm::deleteTab {<pos>}`

Description

deletes an additional tab

Parameters:

pos	position of the tab in the display (starting with 0)

Return:

nothing

19.

The Console can be activated via View → Console

In the console Tcl commands can be executed as well as user scripts and procedures.

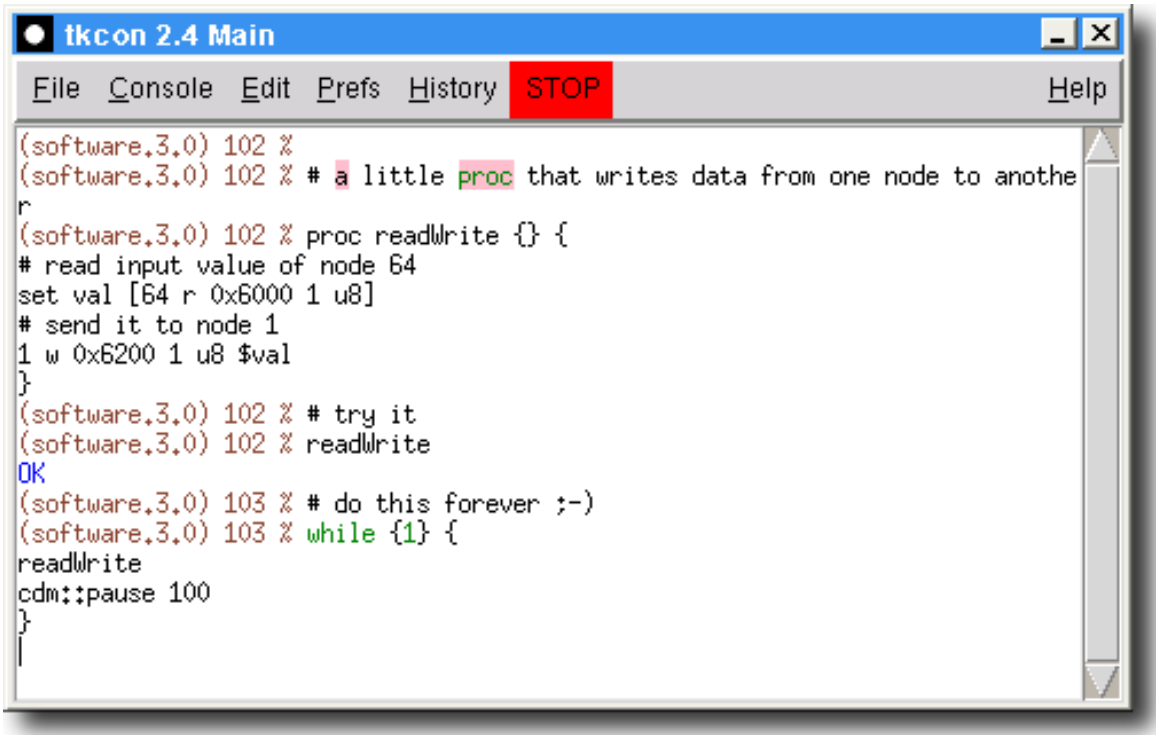

tkcon 2.4 Main
File Console Edit Prefs History STOP Help
(software,3,0) 102 %
(software,3,0) 102 % # a little proc that writes data from one node to anothe
r
(software,3,0) 102 % proc readWrite {} {
# read input value of node 64
set val [64 r 0x6000 1 u8]
send it to node 1
1 w 0x6200 1 u8 $val
}
(software,3,0) 102 % # try it
(software,3,0) 102 % readWrite
OK
(software,3,0) 103 % # do this forever ;-)
(software,3,0) 103 % while {1} {
readWrite
cdm::pause 100
}

Figure 38: Console

19.1.

A description of the Tcl script language exceeds the scope of this manual. To illustrate some special features and basics some simple examples will be given for using Tcl commands in the Console window.

The bibliography refers to books and web pages for the Tcl language.

EXAMPLE:

```
set val 5       ;#set the variable val to the value 5
set val         ;#show the current value of the variable val
puts "Hello"    ;#put the word Hello at the Console
# comment
set myarray(baud)   19200      ;#define the array myarray
set myarray(parity) even
# variables are referenced by using its name preceeded with "$"
puts "Bitrate: $myarray(baud)" ;#reference of the array myarray
```

Further information can be found at www.tcl.tk ⟨http://www.tcl.tk⟩.

19.2.

Sequences of Tcl commands inclusive of controlling structures can be created with a text editor. These files used to have the extension *.tcl and can be loaded from the EtherCAT® Device Monitor:

per menu: File → Load File
interactively: input in the Console `source <file>.tcl`

Command sequences can be combined to procedures. The procedure is executed by calling the name of the procedure.

Procedures saved in Tcl files are available after loading the script file.

EXAMPLE:
file example.tcl:

```
# ------------------------------------------------------------
# show Hello
# ------------------------------------------------------------
proc showHello { name } {
    puts "Hello $name"
    puts "How are you?"
    return
}
```

load the script with the source command in the Console:

```
source example.tcl
```

execute the defined procedure in the Console interactively:

```
$ showHello Heinz
Hello Heinz
How are you?
```

20.

The DSP 402 extension consists of 3 components for the simplification of the work with drives in conformity with the DSP402.

This extension can be activated via Extras → Plug-in -> DSP 402 Extension. They are only available, if the appendant license has been purchased.

20.1.

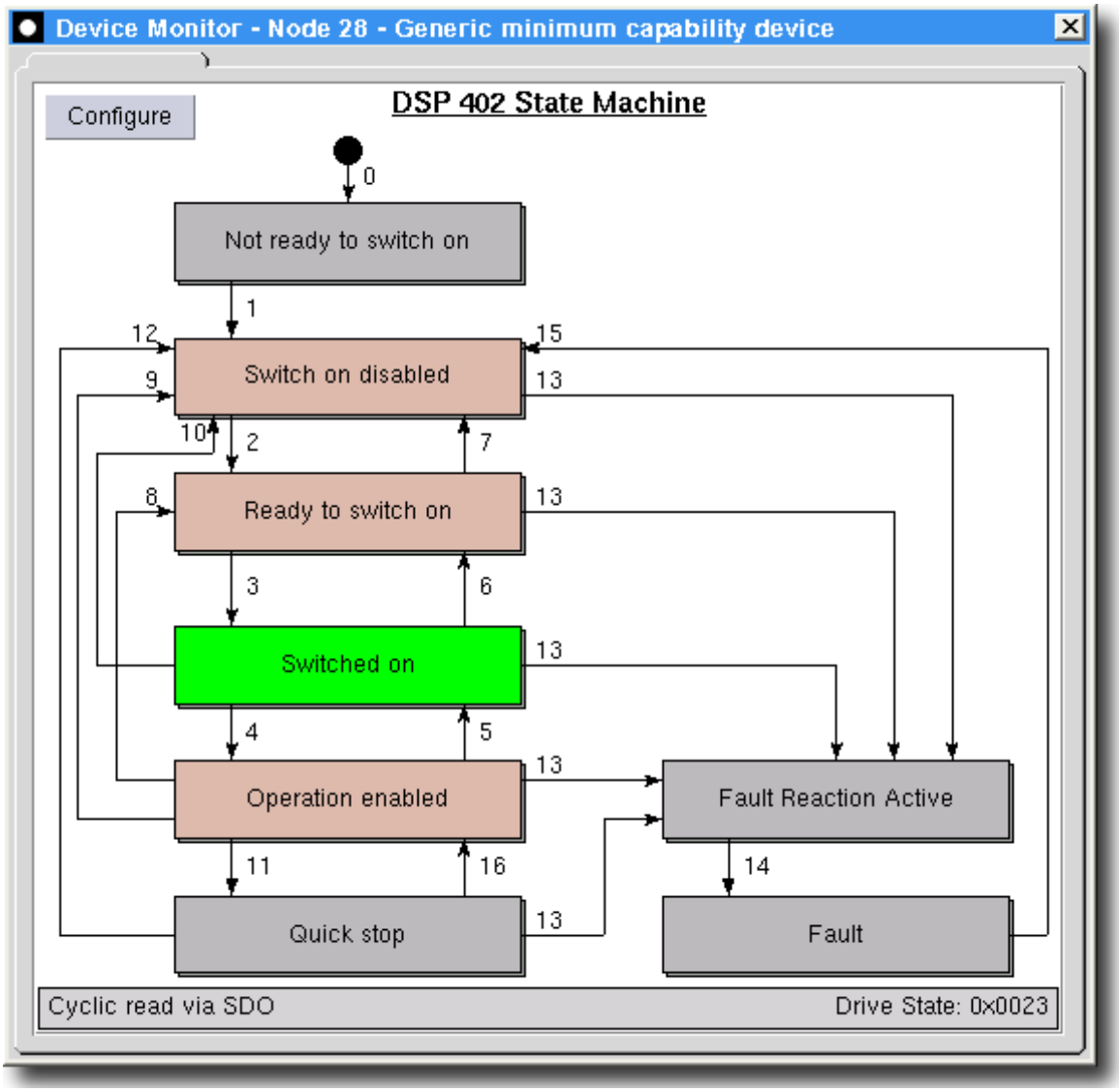


Figure 45: DSP402 state machine

The state deposited green is the current state of the drive. Pale brown fields indicate possible next states and gray fields aren't obtainable directly from the current state. The current value of the status word is displayed under the state machine down on the right.

The configuration dialog can be opened by the button "Configure". This dialog allows the configuration of the acces mode to the device and the axle of the device. These settings are also valid for the other DSP402 extensions.

20.2.

The profile velocity mode tab simplifies controlling EtherCAT® drives in the profile velocity mode.

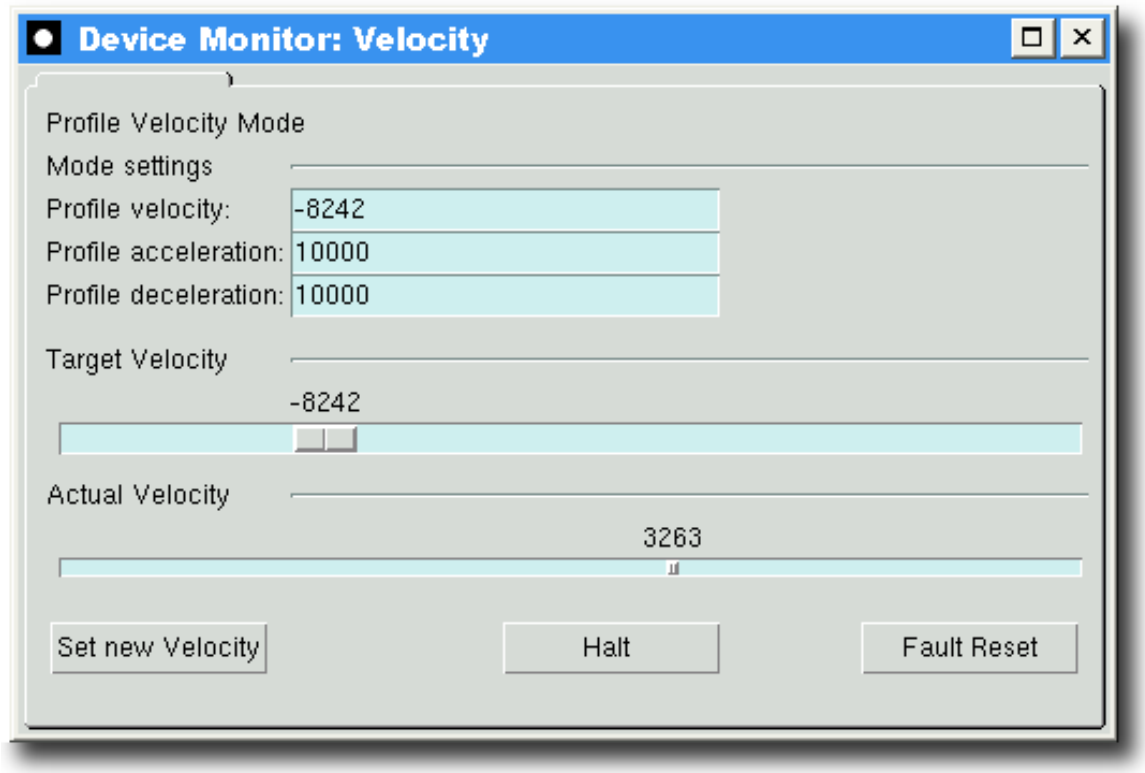


Figure 46: Profile velocity mode tab

20.3.

The Position Mode Tab simplifies the test and the commisioning of a device. The speed, the acceleration and the delay as well as the target position can be configured comfortably. Limiting values for these parameters are read from the objects of the device at the initialization of the tab and can't be exceeded. After pushing the start button the drive executes the predefined movement. The communication with the device is carried out via SDOs.

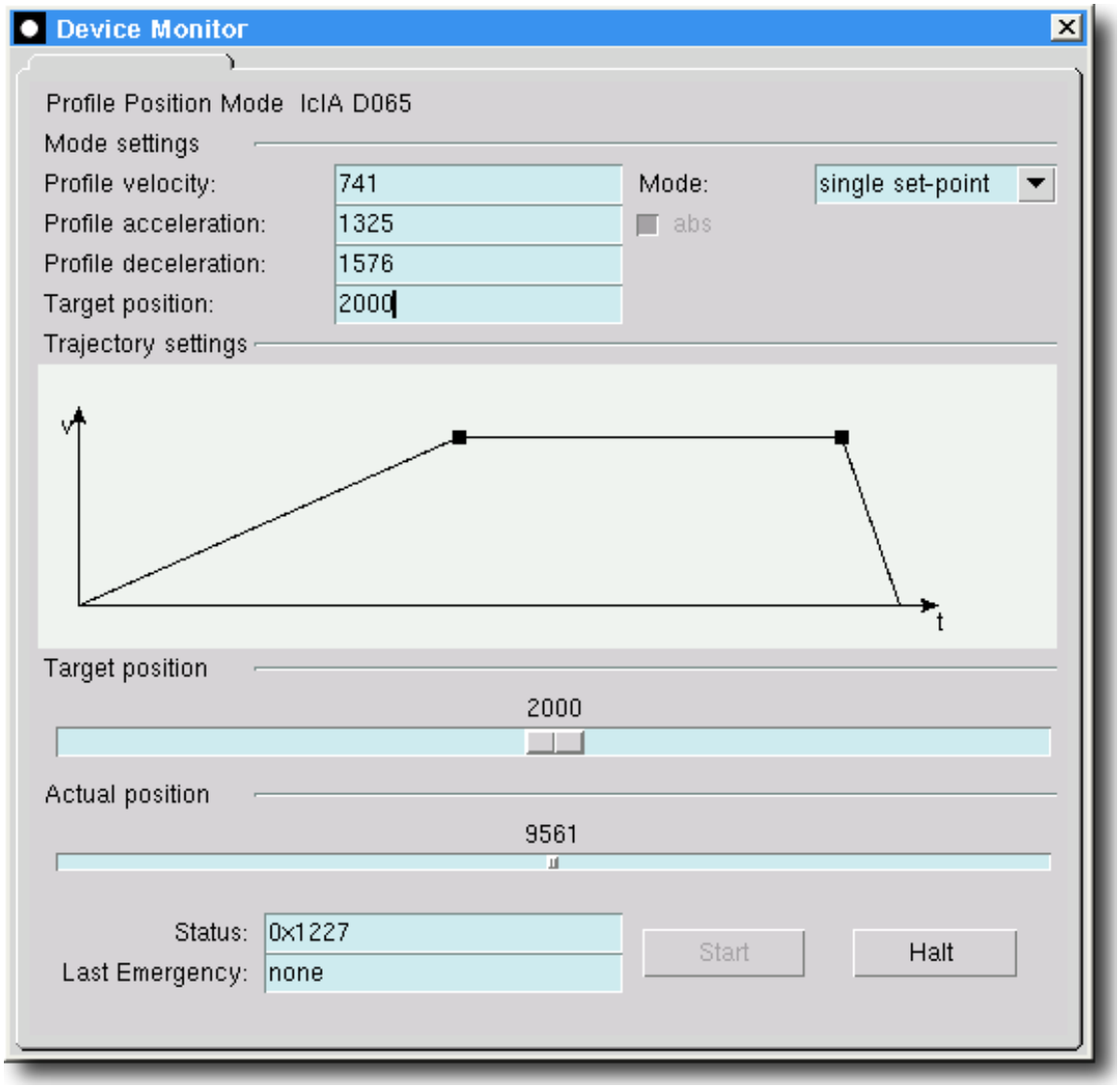


Figure 47: DSP402 Position Mode

20.4.

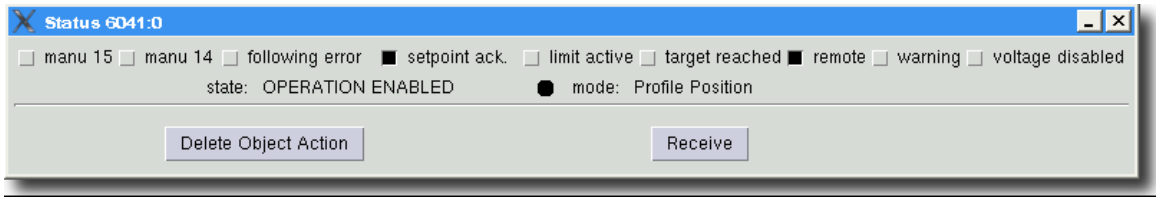


Figure 48: Status word bit box

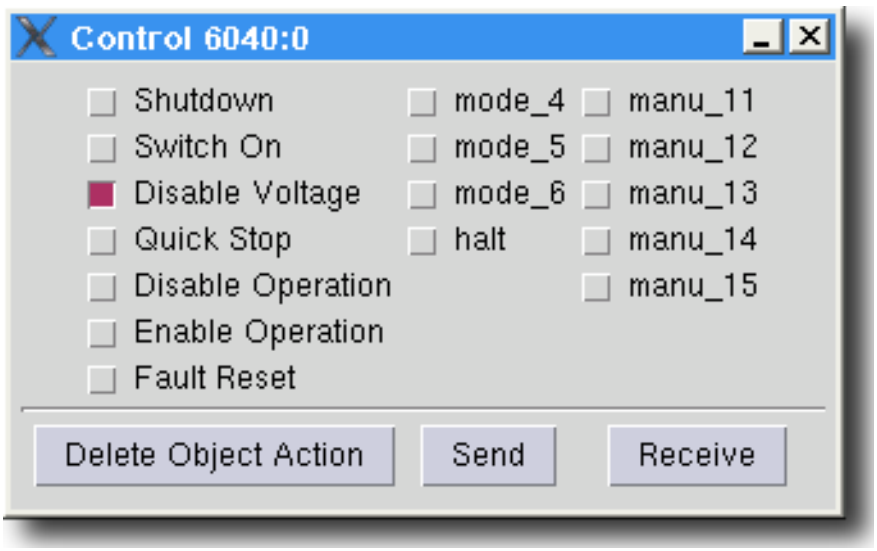


Figure 46: Control word bit box

These extensions are special bit boxes for the status and the control word.

21.

21.1.

The about dialog provides information about:

- the current release
- the type of this release
- the licensee,
- the license and
- the available Tcl/Tk packages.

21.2.

When requesting information about the latest release of the EtherCAT® Device Monitor, a http connection to our server is established and the data (approx. 30 bytes) are downloaded from the server.

NOTHING (except your IP address) IS SENT TO THE SERVER WHEN RETRIEVING THE LATEST RELEASE INFO.

22.

22.1.

`r  <index> <subindex> <typ>`

Description:
SDO read procedure

Parameters:

index	object index
subindex	object subindex
typ	datatype of object <u8|u16|u32|i8|i16|i32|r32|vs>

Results:

read	value

`rr  <index> <subindex> <typ>`

Description:
SDO read procedure: type out the SDO read command and the answer from the device

Parameters:

index	object index
subindex	object subindex
typ	datatype of object

Results:

read	value

`rrc  <index> <subindex> <typ> <ref>`

Description:
SDO read and compare procedure: type out the SDO read command, type out the answer from the device and compare the received value with the reference value

In case of an error the global variable test_error is set to 1.

Parameters:

index	object index
subindex	object subindex
typ	datatype of object
ref	reference value

Results:

0	received value is equal to the reference value
1	received value differs from the reference value

`rre <index> <subindex> <typ>`

Description:

SDO read and message error: type out the SDO read command,
type out the answer from the device and check the received value

Parameters:

index	object index
subindex	object subindex
typ	datatype of object

Results:

0	received no SDO abort domain transfer
1	received SDO abort domain transfer

`w <index> <subindex> <typ> <val>`

Description:

SDO write procedure

Parameters:

index	object index
subindex	object subindex
typ	datatype of object <u8|u16|u32|i8|i16|i32|r32|vs>
val	value

Results:

OK	value has been written to the object
ERROR*	CiA 309-3 error code if SDO transfer failed

`ww <index> <subindex> <typ> <val>`

Description:

SDO write procedure: type out the SDO write command and the answer
from the device

Parameters:

index	object index
subindex	object subindex
typ	datatype of object
val	value to write

Results:

nothing

`wwc <index> <subindex> <typ> <val> <expected>`

Description:

SDO write and compare the expected result
the returned value is compared with the expected one.
typical a write can return "OK" or some errors beginning with "error"

one or two lines with the command and the result are printed to std-out.
the last line contains a right justified flag for
OK - the returned value matches the expected
FAILURE - the returned value does not matche the expected

In case of an error the global variable test_error is set to 1.

Parameters:

index	object index
subindex	object subindex
typ	datatype of object
val	value
expected	the expected return string

Results:

0	received value is equal to the expected value
1	received value differs from the expected value

`wwe <index> <subindex> <typ> <val>`

Description:

SDO write and message error: type out the SDO write command,
type out the answer from the device and check the received value

Parameters:

index	object index
subindex	object subindex
typ	datatype of object
val	value

Results:

0	received no SDO abort code
1	received SDO abort code

22.2.

::cdm::addTab <titel> <pos>

Description:
adds a tab into the Tabset of the right side

Parameters:

titel	name of the Tab displayed at the ...
pos	position starting with 0, can be end

Results:

frame	the window name of the top level frame within this tab

::cdm::deleteTab <pos>

Description:
deletes a tab from the tabset

Parameters:

pos	position starting with 0, can be end

Results:

::cdm::addTestTabOld <filename> <title>

Description:
adds a special tab on the right side of the device monitor;
the tab-card contains checkbuttons for test-scripts,
the list with scripts is in a file and will set by user

Parameters:

filename	name of the file which contains a list of scripts for the special tab
title	title of the tab

Results:

window	path to Tab

::cdm::stringCenter <string> <l>

Description:
center string -- prepend spaces to a given string
if the result will be printed it looks like it is centered within
a line lenght of l

Parameters:

string	unformated string
l	desired line length

Results:

centered	string

::cdm::stringFill <string> <endword> <l>

Description:
append spaces and endword at string until line length l

Parameters:

string	unformated string
endword	optional END-word, defaults to {}
l	desired line length, defaults to 80

Results:

formatted	string

::cdm::banner

Description:
prints a headline with device and user characteristic

Parameters:
nothing

Results:
nothing

::cdm::putsDateTime

Description:
prints the current date and time

Parameters:
nothing

Results:
nothing

::cdm::commentInput <wtitle> <cancelstring>

Description:
user input for comments

Parameters:

wtitle	window title
cancelstring	cancel string

Results:
nothing

::cdm::userDialog <title> <type>

Description:
user response dialog
if a dialaog is finished with "Not Ok" another dialogbox
for giving a reason is opened

Parameters:

title	additional text for displaying to the user
type	specifies the type of dialogue
-	0 ... only wait for OK
-	1 ... decide between OK and NotOk
-	2 ... decide between OK NotOk and Abort
-	3 ... decide between OK and NotOk without comment
-	4 ....decide between list of given choices.

Results:

0	decided for OK
1	decided for Not OK
2	decided for Abort
or	selected button(text) for type 4

22.3.

::cdm::getObjectType <node> <index>

Description:
Returns the objectType

Parameters:

node	node-ID ({} means current node ID) as %d or 0x%x
index	index as %X, or 0x%x

Results:

Returns	objectType (VARIABLE,ARRAY,RECORD,DOMAIN)
throws	an error, if the index does not exist

::cdm::getDataType <node> <index> <sub>

Description:
Returns the data type of a sub index

Parameters:

node	node-ID ({} means current node ID) as %d or 0x%x
index	index as %X, or 0x%x
sub	subindex (opt) as %03d, %0x or 0x%x

Results:

Returns	DataType (u8|u16|u32|i8|i16|u32|r32|vs)
throws	an error, if the index does not exist

::cdm::getName <node> <index> <sub>

Description:
Returns the parameter name of an object from the EDS

Parameters:

node	node-ID
index	index
sub	sub index (opt) as %03d, %0x or 0x%x

Results:

returns	the parameter name or throws an error if the object does not exist

::cdm::getDefaultValue <node> <index> <sub>

Description:
Returns the default value of an object from the EDS

Parameters:

node	node-ID
index	index
sub	sub index (opt) as %03d, %0x or 0x%x

Results:

returns	the default value, throws an error if the object does not exist

::cdm::existObject <node> <index> <sub>

Description:
Checks, if an object exists in the EDS file

Parameters:

node	node-ID ({} means current node ID) as %d or 0x%x
index	index as %X, or 0x%x
sub	subindex (opt) as %d, 0x%x

Results:

1	object exists
0	object does not exist

::cdm::getRemoteID

Description:
Returns the current remote ID

Parameters:
-

Results:

Returns	the remote-id

::cdm::setRemoteID <id>

Description:
Sets the remote id and updates the OD tree

Parameters:

id	remote node id

Results:

1	success
0	invalid ID

::cdm::loadEds <fileName>

Description:

Loads an EDS file for a node and after that
it looks for a description file with a matching name
and loads it.
If there is a matching device-specific .rc-file
it is sourced to. This file must contain valid Tcl or CDM commands

Parameters:

fileName	path to EDS file (POSIX style)

Results:

-

setMessageLogLimit <limit>

Description:

Set a new limit of lines for the message log

Parameters:

limit	max number of lines in message log

Results:

Returns	OK if limit is ok, otherwise a verbose error

::cdm::hideGUI <flag>

Description:

Hides the CDM GUI.
This function is useful for scripts that build their own
user interface.

Parameters:

flag	(opt.) use -noconsole to exclude the console window

Results:

-

::cdm::showGUI <flag>

Description:

Shows the CDM GUI. Counterpart of ::cdm::hideGUI
This function is useful for scripts that build their own user interface.

Parameters:

flag	(opt.) use -noconsole to exclude the console window

Results:

-

isColor <color>

Description:
Checks if a color is a valid tcl color

Parameters:

color	color name or #hex expression

Results:

1	is valid color
0	is no valid color

int2asc <i>

Description:
Converts an unsinged char value into a ASCII representation

Parameters:

i	unsigned char value

Results:

Returns	an ascii value

int2bits <i> <digits>

Description:
Converts an integer value into a binary representation like 0b01010101

Parameters:

i	integer value
digits	length of the returned value (opt.)

Results:

Returns	a binary value

::common::every <script> <ms>

Description:
This proc runs a script cyclically.
The global variable every(script) stores the after-id
for each script.

Parameters:

script	script to run
ms	interval in ms (opt.) defaults to 1000

Results:

-

clear_messagelog

Description:

This proc deletes the content of the message log

Parameters:

-

Results:

-

save_messagelog <filePath>

Description:

This proc saves the content of the message log into a file

Parameters:

filePath	path to writable file

Results:

-

clear

Description:

This proc deletes the content of the CDM console

Parameters:

-

Results:

-

`tkcon save  <filePath> <spec>`

Description:

This command saves the content of the CDM console to a file

Parameters:

filePath	path to writeable file
spec	content specifier (use all for all content)

Results:

-

22.4.

`::402::ret`

Description:

List of possible return values

Parameters:

-

Results:

0	OK
1	Drive in wrong state
2	Transition not possible
3	SDO abort occured
4	No setpoint acknowledge

`::p402::ppHandleNewSetpoint  <delayTime>`

Description:

This function handles a new setpoint in the Profile Position mode.
The function initiates an absolute movement
in the single-setpoint mode.
If this function returns with an error
it is possible that the mode-specific bits in
object 0x6041 (controlword) and object 0x6041
(statusword) are not cleared.
Each drive needs a specific time for the transfer
of a new setpoint. This time can be specified by
the argument delayTime.
The communication is done via SDO.
This function can only be used for single drive devices.
This function is used by other functions of this
namespace.

Parameters:

delayTime	time for transfer in ms

Results:

ret	see variable ::p402::ret

`::p402::getState`

Description:

This function gets the actual CiA-402 state of the drive.
The actual CiA-402 state is returned
in the format of object 0x6041 (statusword).
The communication is done via SDO.
This function can only be used for single drive devices.

This function returns a list with the following elements: retsee variable ::p402::ret stateactual CiA-402 state in statusword format The state is only valid if this function returns with ok.

Example for usage:

```
set retList [::p402::getState]
set retVal [lindex \$retList 0]
if { [set retVal] != [set ::p402::ret(OK)] } {
 puts "Error: getState() returns with [set retVal]."
}
set actualState [lindex \$retList 1]
```

If actualState is 0x0027 the drive is in the state OPERATION ENABLED.

Parameters:

-

Results:

retList	value of ::p402::ret + actual CiA-402 state

`::p402::changeState  <state> <delayTime>`

Description:

This function changes into the desired CiA-402 state.
The desired CiA-402 state must be input
in the format of object 0x6041 (statusword).
Each drive needs a specific time to change the CiA-402 state.
This time is set by the argument delayTime.
The communication is done via SDO.
This function can only be used for single drive devices.

Example: The argument state must be 0x0027 for
a change into the CiA-402 state OPERATION ENABLED.

Parameters:

state	desired CiA-402 state
delayTime	maximal time for state changing in ms

Results:

ret	see variable ::p402::ret

::p402::halt

Description:

This function activates the halt function,
i.e. the motion is halted.
The Halt bit in object 0x6040 (controlword) is set.
To reset Halt use the function ::p402::<mode>Change,
because the necessary functionality to reset Halt is
mode-specific.
The communication is done via SDO.
This function can only be used for single drive devices.

Example for reset Halt:
use ::p402::ppChange for the pp mode

Parameters:

-

Results:

ret	see variable ::p402::ret

::p402::modeStop <delayTime>

Description:

This function stops a motion by the CiA-402 state transition
from the CiA-402 state OPERATION ENABLED into the CiA-402
state SWITCHED ON. The drive is stopped.
The communication is done via SDO.
This function can only be used for single drive devices.

Note: The operation mode is not changed to NO_MODE,
because not all drives support NO_MODE.

Parameters:

delayTime	maximal time for state changing in ms

Results:

ret	see variable ::p402::ret

::p402::pvStart <targetVelocity> <profileAcceleration> <delayTime>

Description:

This function starts a motion in the Profile Velocity mode.
The Profile Velocity mode is configured by the
mandatory objects of the pv-mode.
The operation mode is set to Profile Velocity.
The motion is started by the change into the CiA-402 state
OPERATION ENABLED.
The communication is done via SDO.
This function can only be used for single drive devices.

Parameters:

targetVelocity	value of object 0x60FF
profileAcceleration	value of object 0x6083
delayTime	maximal time for state changing in ms

Results:

ret	see variable ::p402::ret

::p402::pvChange <targetVelocity>

Description:

This function changes the velocity of the movement in the
Profile Velocity mode.
The communication is done via SDO.
This function can only be used for single drive devices.

Parameters:

targetVelocity	value of object 0x60FF

Results:

ret	see variable ::p402::ret

::p402::ppStart <targetPos> <profileVel> <profileAcc> <delayTime>

Description:

This function starts a motion in the Profile Position mode.
The Profile Position mode is configured by the
mandatory objects of the pp-mode.
The operation mode is set to Profile Position.
This function initiates an absolute movement in the
single-setpoint mode.
The motion is started by the change into the CiA-402 state
OPERATION ENABLED and the execution of the new-setpoint
handling.
Each drive needs a specific time for the transfer
of a new setpoint. This time can be specified by
the argument delayTime.
The communication is done via SDO.
This function can only be used for single drive devices.

Parameters:

targetPos	value of object 0x607A
profileVel	value of object 0x6081
profileAcc	value of object 0x6083
delayTime	transfer time in ms

Results:

ret	see variable ::p402::ret

`::p402::ppChange <targetPosition> <delayTime>`

Description:

This function changes the target position in the Profile
Position mode.
This function initiates an absolute movement in the
single-setpoint mode.
The movement is started by the execution of the new-setpoint
handling.
Each drive needs a specific time for the transfer
of a new setpoint. This time can be specified by
the argument delayTime.
The communication is done via SDO.
This function can only be used for single drive devices.

Parameters:

targetPosition	value of object 0x607A
delayTime	transfer time in ms

Results:

ret	see variable ::p402::ret

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[6] http://wiki.tcl.tk

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The BLT Toolkit.
BLT is an extension to the Tk toolkit, adding new widgets, geometry managers, and miscellaneous commands.

23.

CAN	Controller Area Network
CAL	CAN Application Layer (CANopen base)
CDM	CANopen Device Monitor
CiA	CAN in Automation international users and manufacturers group e.V.
CN	Controlled Node
COB	Communication Object (CAN Message)
COB-ID	Communication Object Identifier
CSDO	Client SDO
EDM	EtherCAT Device Monitor
EDS	Electronic Data Sheet
ESI	EtherCAT Slave Information file
EMCY	Emergency Object
EPSG	Ethernet POWERLINK Standardization Group
ETG	EtherCAT Technology Group
MN	Managing Node
NMT	Network Management
OD	Object Dictionary
PDO	Process Data Object, unconfirmed service for real time communication
RPDO	Receive PDO
RTR	Remote Transmission Request
PDM	POWERLINK Device Monitor
PRMS	Problem Report Management System
SDO	Service Data Object, Confirmed data transfer service for parameter data.
SSDO	Server SDO
SYNC	Sychronization Object
Tcl	Tool Command Language (script language)
TCP/IP	Transmission Control Protocol/Internet Protocol
TIME	Time Stamp Object
TPDO	Transmit PDO
Widget	element of a graphical user interface (e.g. button, entry filed, menu, ...)

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